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A mixed methods investigation into the Barriers and Facilitators of Exercise Referral Scheme adherence: implications for enhancing participant experience.

M. C. Kelly

PhD

2020

A mixed methods investigation into the Barriers and Facilitators of Exercise Referral Scheme adherence: implications for enhancing participant experience.

MICHAEL CHRISTOPHER KELLY

A thesis submitted in partial fulfilment of the requirements of the University of Northumbria at Newcastle for the degree of Doctor of Philosophy.

Research undertaken in the Faculty of Health & Life Sciences

February 2020

Abstract

Background: Exercise Referral Schemes (ERS) have been used to promote physical activity in individuals who are at risk of, or who have developed, health conditions associated with a sedentary lifestyle. However, participant adherence to ERS has been highlighted as an issue, typically around 50% across published studies. There is limited understanding of what characteristics predict adherence, beyond gender or age, and minimal understanding about why adherence is limited. This thesis utilises a multistage explanatory sequential mixed method design to: investigate adherence, and the predictors of adherence within the South Tyneside ERS (study one); understand what the barriers and facilitators to adherence are, and explore why they are present (study two); use the findings to design and implement an intervention to increase adherence (study three).

Study one: A retrospective cohort study (*n* = 6796) revealed that 50.7% of participants starting the scheme adhered, and the majority of dropout (36.9%) occurred within the first six weeks. Males, older participants, primary care referrals, participants with mental health conditions and nutrition referrals were associated with dropout. Smokers and tier 3 referrals predicted dropout, whereas increasing age, drinking alcohol, being a secondary care referral, or citing a lack of motivation, or a lack of childcare as a barrier to adherence, decreased the likelihood of dropout.

Study two: Semi-structured interviews and a focus group were undertaken and analysed using framework analysis. The semi-structured interviews consisted of participants (*n* =11) aged under 55 years, who dropped out of the ERS within the first six weeks. The focus group included seven males, all aged over 64 years who completed the ERS. The interviews identified barriers to adherence, issues with communication, facilitators, and directions for the future to improve the scheme. Communication appeared to be a significant issue, with limited collaboration between staff and participants, resulting in untailored programmes for participants and consequences which contributed to a negative experience for participants. The focus group identified barriers to adherence that they overcame, facilitators to adherence, what participants felt were keys to success, and suggestions to improve the scheme in the future. Finance, exercising with other gym users and feeling embarrassed were barriers, whereas social contact, staff and being older/retired were viewed as facilitators. Effort, commitment and perseverance were cited among the keys to successful adherence. The interviews and focus group identified a need and request by participants, to have more education and support relating to nutrition and exercise, to facilitate a more autonomous approach to being physically active.

Study three: an educational pamphlet containing content informed by study two and the wider evidence base, was designed and developed for the Healthy Lives class, a replacement for the decommissioned ERS. The pamphlet was assessed using a quasi-experimental pilot trial, to assess the potential impact on fitness class attendance and on the patient activation measure (PAM). The acceptability of the pamphlet was assessed using a focus group containing participants that had been issued with the pamphlet. Participants in the intervention group (*n* = 13) were provided with the pamphlet for ten weeks, while the control group (*n* = 6) were provided the pamphlet at the study's conclusion. Recruitment was limited, making interpretation of the findings difficult. PAM scores increased, in both groups, with the intervention group making a greater increase compared to the control group. The focus group participants (*n* = 9) deemed that the pamphlet, including its design and content, was acceptable for use in the Healthy Lives classes.

Conclusion: Adherence to ERS remains problematic, particularly for younger participants. Limited communication appears linked to dropout, and participants desire more education about nutrition and exercise, to support physical activity. Educational pamphlets appear to be appreciated by participants, however their impact on adherence remains unknown.

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Preface

The beginning of the thesis, and the Exercise Referral Scheme.

The Genesis of this thesis began with a conversation including the lead of a local Musculoskeletal service, a General practitioner, who regularly referred patients to an affiliated Exercise Referral Scheme (ERS). The conversation revolved around adherence to the scheme and how to improve it. Following my employment at Northumbria University, in October 2014, I was approached to consider this as the PhD theme. As a Musculoskeletal Physiotherapist who had referred patients to ERS, particularly patients that would, in my view, benefit in the long-term from a generalised increase in physical activity levels, this was an area of interest, and one that I wanted to contribute to. I had witnessed first-hand, in my Physiotherapy role, and from my Sport and Exercise Science background, the negative impact that limited physical activity had on health. The drive to support physical activity, forming both prevention and treatment, was also increasing, not only in the general population, but also within Physiotherapy and Musculoskeletal services. Exercise adherence has been a long standing issue in terms of Physiotherapy and it was clear even from a cursory investigation of the ERS literature, that adherence was problematic. As an individual who has always attended the gym or participated in competitive sport, attributing this to an injury free and healthy life, it was intriguing to understand why people did not take the opportunity for free and supported exercise, especially in light of the widely reported benefits of exercise. This intrigue ultimately helped decide that this topic would form the thesis.

The exercise scheme that forms the basis of this thesis is the South Tyneside ERS. South Tyneside is a metropolitan borough within the North East of England, with a population of 148,900 (as of 2016) run by South Tyneside Council, based within South Shields. Public Health England (PHE, 2020) reported that the health profile for South Tyneside in 2019, was generally worse than the average in England, and is one of the 20% most deprived, with significantly worse levels of employment. The area had a significantly higher mortality rate from cardiovascular disease and cancer, and lower life expectancies in men and women, compared to the national average. The area also had a significantly worse (higher) prevalence of smokers, physically inactive adults and adults classified as overweight or obese. Worryingly, this trend does not appear to be abating, as the area also had significantly more obese children compared to the national average (PHE, 2020).

Despite, or perhaps because of, the many treads towards ill-health in this area, South Tyneside had developed an award winning ERS. The scheme was initially founded in 1997, with the aim of supporting and increasing physical activity participation to reduce obesity and chronic heart disease. Over time, the scheme developed to provide a more structured programme of care, focused on increasing long term physical activity and reducing or modifying health risk factors. This therefore opened the opportunity for referral onto the scheme for people with high blood pressure, diabetes, asthma, joint problems, stress or depression.

At the start of this thesis, in January 2015, participants could be referred into the scheme by a General Practitioner (GP) or a health care professional, if they believed that the participant would benefit from a personalised physical activity programme. During the final two years of the scheme (2015-2017), referrals could be made via post, fax or through electronic means. Prior to this, referrals were made via post or fax. Referrals were sent to the scheme administrator, who in turn contacted the participant by post, to make an initial appointment for an assessment. If no contact was received by the scheme from the participant within two weeks, the administrator made contact via telephone, to organise an initial assessment. Written confirmation of the initial assessment was then sent to the participant, two weeks prior to the assessment.

Referrals were risk stratified, where participants deemed high risk (i.e. cardiac rehabilitation referrals) were managed only by exercise professionals with the appropriate qualification. Participants could choose the location of the initial assessment, which included one primary care facility and four leisure centres. The scheme was based within a hub, located centrally within South Tyneside, where the ERS staff were predominantly based, and was adjacent to the one of the leisure centres. The majority of the participants chose this as the location for the initial assessment.

The initial assessment was conducted by an exercise professional, and if the participant had a BMI >28kg/m^2, also a nutritionist. The assessment aimed to identify the participants readiness to change, their individual goals, and evaluate their lifestyle in terms of alcohol consumption, smoking status, healthy eating and levels of physical activity at the time of assessment. Consent forms and pre-programme health and fitness assessments were also completed in the initial assessment. An individual exercise programme was devised for the participant, based on the lifestyle evaluation and fitness assessment. The initial assessment

also provided the opportunity where appropriate, to signpost the participant to other support services, such as smoking cessation. Following the initial assessment, participants were free to use any of the four leisure centres/facilities within the scheme.

If the referral form was not correctly completed by the original referrer, the administrator contacted the referrer for further information. In this circumstance, the participant was able to attend the initial assessment, but the final exercise programme could not be designed until all of the referral information had been collected. If the participant did not attend the initial assessment, a letter was sent to them, inviting them to reschedule. If no contact was made by the participant after two weeks, a letter was sent by the scheme administrator, to the original referrer, advising them of non-attendance and withdrawal from the scheme.

Participants were assigned an exercise professional for the duration of their time in the scheme as a point of contact and for support. Where possible, this was the same exercise professional undertaking the initial assessment. If not, an exercise professional was assigned to the participant, and this professional would conduct the follow up assessments at six and 12 weeks. The exercise professionals were based in the central hub for administrative work but were also assigned to a specific leisure centre. This aimed to improve continuity for participants. As the participants had chosen the location for their initial assessment, they were therefore more likely to be assessed and managed by the exercise professional based within the same location.

The second assessment at six weeks served to measure the participants progress and discuss how they could continue to exercise. The assessment was then repeated when participants completed their individual programme at 12 weeks. The assessment included an end of course evaluation and a summary of results (including pre and post scheme comparison), which were sent back to the original referrer (i.e. GP or healthcare professional). The data collected was also inputted by the individual members of staff into electronic files, kept within the central hub. Participants that did not attend the agreed follow-up assessments, were contacted to ascertain if they wished to continue with the scheme. If no reply was received within two weeks of contact, there were considered to have left the scheme, and the original referrer was informed.

All participants who completed their initial 12-week programme were offered a further 24 weeks graduate membership, which entitled them to continue to exercise at a reduced cost.

The scheme had up to 8 full time members of staff. All staff were qualified as a minimum, to a level 3 advanced gym instructor, with a level 3 exercise referral qualification, accreditation in fitness testing and assessment, and an appropriate first aid certificate. Staff also had a wide range of specialities to support participants entering the scheme, including maternity, post-natal and nutritional support. Staff assigned to high risk (cardiac) participants, all held the BACR (British Association of Cardiac Rehabilitation) qualification, while all staff were members of the Register of Exercise Professionals (REPS).

At the beginning of this thesis, it was not clear how well the ERS performed, and what avenues could be considered to improve it. This thesis ultimately aims to understand how well the ERS performs, for who, understand why participants dropout, and to understand how to improve the ERS in the future.

Acknowledgements

First and foremost, I must thank my family. My parents Josie and David, brother James, and especially my wife Sarah, and our amazing daughter Eva. Without the encouragement of my parents, I wouldn't have contemplated attending a university nearly 20 years ago, which ultimately opened the possibility of becoming a Physiotherapist and a Lecturer. They have put up with me perpetually being a student, provided a roof over my head and provided emotional support throughout. My wife Sarah has been the most solid of rocks. Despite knowing that continuing my studies while working clinically, would result in us missing out on many weekends together, and knowing that the pursuit of a lecturing position would place us under financial strain, she supported me throughout. In that time, she organised our wedding and give birth to Eva. Since Eva's birth, Sarah has taken the lead on looking after her, as the commitments of my job, alongside this thesis, have limited my ability to be the Father and Husband I should be, two areas I have fallen painfully short in. However, the last two years of work have resulted in the job I aimed for and the completion of the thesis. I cannot wait to continue our lives together, by spending more of our time together bringing up Eva. All of the hours spent working late or on the weekends will feel worth it. Sarah's family and James, have all played their part in helping me through this experience. That has been in the form of looking after Eva, helping mend the house, or in the case of James, buying me history books to read for Christmas, and saving me time opening them by not wrapping them in paper! In terms of the thesis itself, Professor Nick Caplan, Dr. Sarah Partington and Diane Walker have provided amazing support throughout, and without their support this thesis wouldn't have started, and certainly would not have been completed. My colleagues within the Physiotherapy teaching team have provided support throughout, with hints and tips, and made me feel welcome from the very first day. I must provide a special mention to Dr. Jenni Naisby, who has literally sat beside me throughout this experience. Her knowledge, guidance and wise council, has been of invaluable worth, in terms of the thesis and my development as a lecturer. It has been my enduring pleasure to learn from, and work with her, and the Physiotherapy team as a whole.

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinion, ideas and contributions from others.
Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the faculty ethics committee.

I declare that the Word Count of this Thesis is: 84,519

Name: Michael Kelly

Signature:

Chapter One: Introduction

1.1 The implications of insufficient physical activity and sedentary lifestyles

The importance of Physical Activity (PA), exercise and maintenance of PA levels have been well publicised within the public health and academic domains. The World Health Organisation (WHO) goal of a 10% relative reduction in the prevalence of insufficient PA, as part of the Global action plan for the prevention and control of non-communicable diseases (WHO, 2013) and the Lancet series (Ekelund *et al.*, 2016; Ding *et al.*, 2016; Sallis *et al.*, 2016; Reis *et al.*, 2016) aiming to encourage policy makers to take PA more seriously, highlight the importance of integrating PA into daily lives (Das and Horton, 2016).

The above actions were in response to the increase in Non-Communicable Diseases (NCDs). Non-communicable diseases are a medical condition or disease that is non-infectious and non-transferable among people (Kim and Oh, 2013). They typically are of long duration and generally slow progression (WHO, 2015) and tend to result from a combination of genetic, physiological, environmental and behavioural factors (WHO, 2018).

An estimated 60% of all deaths in 2003 were attributed to NCDs (Beaglehole and Yach, 2003). A lack of PA has been considered a contributory factor to both non-communicable and psychological health conditions such as coronary heart disease (CHD), musculoskeletal (MSK) conditions, obesity, diabetes, osteoporosis, chronic obstructive pulmonary disease (COPD), declining cognitive function, anxiety and depression (Donaldson, 2004; Sanchez-Villegas *et al.*, 2008; Pavey *et al.*, 2011a; Edwards *et al.*, 2013; Teychenne, Costigan and Parker, 2015). All of these conditions impact on the individual, but are also a threat to human and social development (Beaglehole *et al.*, 2011).

Aside from the health related risks, the financial costs derived from sedentary lifestyles are also significant. The direct and indirect cost of physical inactivity within the UK runs into the billions of pounds, costing up to £1.8 billion for the NHS to treat the effects of physical inactivity annually (DOH, 2010). Diabetes currently costs £10m per year to treat the current 3 million sufferers in the UK, however 7 million people are at risk (NHS, 2014), illustrating the further potential costs that could be incurred should those 7 million individuals become diabetic. Notwithstanding NHS costs, the economy is also afflicted by sedentary lifestyles. The DOH (2010) reports

that sedentary lifestyles cost £8.3 billion, and the NHS (2014) reported that sickness absence costs up to £22 billion, with mental health accounting for more than double of MSK complaints in terms of allowance or incapacity benefits. Seeing that sedentary lifestyles are considered as a contributory factor to depression (Hamer and Stamatakis, 2014), a well targeted health support programme may be able to keep people in work, while improving wellbeing (NHS, 2014).

Physical inactivity is a global issue, with 1.5 billion individuals over the age of 15 years not meeting the minimum recommended PA levels (Hallal *et al.*, 2012). Approximately one third of the World's population is considered physically inactive (Hallal *et al.*, 2012). Specifically within the UK, only 39% of men and 29% of women manage to attain the government recommended 150 minutes of moderate exercise per week in the form of 30 minutes for 5 days per week (Craig, Mindell and Hirani, 2009). Physical inactivity has been identified as the fourth largest mortality risk in the world (WHO, 2009). Insufficient PA and the subsequent health effects is not only prevalent within the UK, but in other western countries such as the USA, who have recognised a need for an increase in PA in light of increasing levels of diseases which are modifiable by exercise (United States. Department of Health and Human Services., 2008).

Ultimately, there is compelling evidence highlighting the increasing prevalence of physical inactivity on a global scale (Hallal *et al.*, 2012) and an increase in ill-health secondary to NCDs (Beaglehole and Yach, 2003). This occurrence is costing healthcare systems and economies alike, running into the billions of pounds and is unsustainable in this current economic climate of limited healthcare resources (Edwards *et al.*, 2013).

1.2 The benefits of PA and increasing PA levels

Although the prevalence of NCDs has increased, there are clear ways to combat this trend. Over the last 50 years, the body of evidence supporting PA as a method of maintaining health has grown significantly. The terms PA and Exercise are often used interchangeably (Caspersen, Powell and Christenson, 1985). However, Caspersen, Powell and Christenson (1985) define PA as "any bodily movement produced by skeletal muscles that results in energy expenditure", and Exercise as "planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness". This distinction will be employed throughout this thesis.

The evidence supporting PA to combat NCDs within the short and long-term is strong and developing. This includes reducing the impact of, or risk of developing an NCD. For individuals that have developed NCDs or other long-term diseases, PA has been shown to help improve the symptoms and eliminate or reduce the risk factors of future disease. Physical activity (in conjunction with a dietary intervention) has been positively linked with the ability to decrease type two diabetes incidence in high risk patient groups (Orozco *et al.*, 2008) and support weight loss (Swift *et al.*, 2014). Physical activity has also been shown to improve aerobic fitness, anaerobic threshold, body fat percentage in obese insulin resistant adolescents (Gow *et al.*, 2015), while also improving weight loss and reducing cardiovascular disease risk factors in adults (Shaw *et al.*, 2006). Fong *et al.* (2012) reported that physical function, psychological outcomes and quality of life improved in breast cancer patients following an average of 13 weeks of exercise. For symptom management of long-term conditions, Cochrane reviews have demonstrated the benefits of PA. Fransen *et al.* (2014) and Fransen *et al.* (2015) reported that PA improves pain and function in patients with Osteoarthritis of the hip and knee respectively, whereas PA has improved quality of life, physical functioning, depression and fatigue in patients with haematological diseases (Bergenthal *et al.*, 2014).

Physical activity has strong evidence supporting its ability to reduce the rates of NCDs including CHD, high blood pressure, stroke, metabolic syndrome, diabetes, depression and cancer (Lee *et al.*, 2012). This is supported in long-term studies that have linked PA to the prevention of weight gain, obesity, CHD and type 2 diabetes (Reiner *et al.*, 2013). Individuals reporting PA levels in line with government recommendations have an associated 19% reduction in mortality risk compared to sedentary individuals (Woodcock *et al.*, 2011). Healthy ageing, where an individual is free from a major chronic disease, major cognitive impairment and generally healthy, is seven times more likely to occur in individuals that remain active in later life (Hamer, Lavoie and Bacon, 2013). Even those who become active later in life benefitted from healthy ageing (Hamer, Lavoie and Bacon, 2013). Almeida *et al.* (2014) reported that men aged 65-83 years, who completed 150 minutes per week of PA, were significantly more likely to be alive and free from functional or mental impairments for 10-13 years longer than men unable to maintain PA. In terms of mental health, the protective effect of PA has manifested as a 20% reduction in the likelihood of developing depression in older adults (Strawbridge *et al.*, 2002). Almeida *et al.* (2006) drew similar conclusions, reporting that good mental health was associated with PA in older men.

The benefits of PA have not only been reported for older people alone. Physical activity has been shown to have a positive relationship with risk factors for metabolic syndromes such as hypertension, obesity, insulin resistance (Cavill, Biddle and Sallis, 2001) and a healthy cardiovascular diseases risk profile in later life (Biddle, Gorely and Stensel, 2004). Additionally, PA can enhance psychological well-being and self-esteem in young people (Cavill, Biddle and Sallis, 2001), including better mental health than less active counterparts (Biddle, Gorely and Stensel, 2004). In younger people, PA has been associated with positive psychosocial outcomes, with those who are physically active appearing to be less likely to suffer from mental health issues (Biddle and Asare, 2011).

Strong evidence supports PA reducing the risk of developing disabling conditions or chronic diseases, when comparing those who are inactive against those who are active (Baker *et al.*, 2015). Sitting behaviour has been associated with adverse mental health outcomes (Biddle and Asare, 2011) and metabolic risk scores (Ekelund *et al.*, 2006). Prolonged sitting itself (as opposed to physical inactivity) has alone been linked to premature mortality and poor cardio-metabolic profiles (Dunstan *et al.*, 2012). Due to the changes in western lifestyle, many aspects of communication, commuting, working and leisure time involve sitting. Sedentary time each day can accrue through sedentary behaviours such as commuting where sitting is the dominant feature (Martin *et al.*, 2015). This severely limits the amount of light activity that would normally be expected, therefore effectively replaces “light activity” which would include activities such as slow walking, or standing (Dunstan *et al.*, 2012). It is important to highlight that there is no consensus on the overall definition of a sedentary lifestyle (Gibbs *et al.*, 2015), though the term sedentary behaviour is often used and typically refers to any waking behaviour utilising low energy expenditure and is characterised by energy expenditure of ≤1.5 Metabolic Equivalents (METS) (Gibbs *et al.*, 2015). It is however encouraging considering that relatively low levels of activity (such as light activity) can provide health gains. Kyu *et al.* (2016) for example, reported that increasing PA to the recommended weekly 150 minutes of brisk walking (600 MET minutes), reduced diabetes risk by 2%, while a further increase to 3600 MET minutes’ reduced diabetes risk by an additional 19%.

In summary, the body of evidence supporting PA as a method of managing the prevalence and symptoms of NCDs in the short and long-term is highly convincing. The body of evidence is not only voluminous, but includes rigorous studies, including Cochrane reviews, and long-term follow-up (over 5 years) systematic reviews,

covering a wide range of populations. However, despite the increase in evidence over the last 50 years supporting PA, unfortunately, the levels of PA undertaken globally and within the UK, particularly with younger individuals, has not shown a concomitant increase (DOH, 2010).

1.3 Exercise Referral Schemes (ERS)

Despite the considerable body of evidence recommending the use of PA to decrease the risks of ill-health or improving the symptoms of ill-health (Campbell *et al.*, 2013), the response of the public has been limited and there remains a distinct need to promote PA (Pavey *et al.*, 2011c). Various methods of addressing the insufficient levels of PA have been attempted, including mass media campaigns, corporate and workplace initiatives, community programmes, professional support and changes to health care structures (Pavey *et al.*, 2011a). However, no single method has been wholly effective, as evidenced by the limited PA levels.

The practice of providing an intervention(s) within the primary care setting has been effective in promoting smoking cessation and the reduction of alcohol intake and is now recognised as an important preventative strategy within these two areas (Orrow *et al.*, 2012). Supporting PA within primary care, was first adopted widely within the 1990's, in the form of ERS (Pavey *et al.*, 2011c). Primary care has been proposed as an ideal setting to identify suitable candidates for ERS as 70-80% of the population will visit the GP once a year (van Doorslaer *et al.*, 2006). This affords GPs and other healthcare professionals' opportunities to identify and refer those at risk of diseases that may be modifiable or managed with PA. Primary care may be an ideal setting to identify and manage patients, as those with low socioeconomic status are more likely to visit primary healthcare (Regidor *et al.*, 2008; Hetlevik and Gjesdal, 2012) and are more likely deficient in PA levels (Gidlow *et al.*, 2006).

Exercise Referral Schemes are used as a method of promoting PA in individuals who are at risk of, or who have developed, health conditions associated with a sedentary lifestyle (NICE, 2014b). Their GP or another healthcare professional typically refers participants to an ERS following the identification of a need to increase PA. Schemes generally run over the course of 10-12 weeks (Campbell *et al.*, 2015), but have been reported to be as short as four weeks and as long as 24 weeks (BHF, 2010; Hanson *et al.*, 2013; Duda *et al.*, 2014).

Exercise Referral Schemes have been utilised to target specific patient or population subgroups (Murphy *et al.*, 2012). Exercise referrals schemes have been commissioned specifically for a wide variety of patient groups, such as cardiac rehab, obesity, diabetes, COPD, asthma, hypertension low back pain and post-surgical rehabilitation (such as total knee replacement or ACL repair) (Edmunds, Ntoumanis and Duda, 2007; BHF, 2010). The most predominant conditions accounting for ERS referrals in 2008 (BHF, 2010) included: mental health, weight, hypertension, asthma, diabetes, inactivity, osteoporosis, arthritis, raised blood cholesterol, COPD and CHD risk factors. More recently, a systematic review and meta-analysis by Pavey *et al.* (2011c) reported that weight problems accounted for 16% of referrals, followed by hypertension (12%), asthma (11%), diabetes (10%), depression (10%), inactivity (7%), anxiety (6%), raised cholesterol (6%) osteoporosis (6%), arthritis (6%), COPD (5%) and Stress (5%). The range of activities offered by ERS is wide, with the majority offering, but not limited to, gym-based or group-exercise classes (BHF, 2010). Other activities include swimming, walking, hydrotherapy, sports, chair based exercise, condition specific classes, jogging/running, cycling, resistance exercise, yoga/pilates and dance (BHF, 2010).

Exercise Referral Schemes gained significant prominence, with up to up to 89% of primary care organisations running a scheme (Sowden and Raine, 2008). Around 600 schemes have been reported as operating (Pavey *et al.*, 2011c) and in 2010 at least 158 schemes were running in Scotland (22) and England (136) (BHF, 2010). The east midlands region had the most schemes (33) and the London Boroughs the least (10) (BHF, 2010). Schemes have also been commissioned within Europe, for example in Scandinavia and Spain (Pavey *et al.*, 2011a), and throughout the world, including Canada, USA, Australia and New Zealand (Thomson, Camic and Chatterjee, 2015).

The range of professionals making referrals is not limited to GPs, but also includes physiotherapists, practice nurses, cardiac rehabilitation professionals, specialist nurses and mental health professionals, who refer the majority of patients (BHF, 2010). Referrals are also made from dieticians, occupational therapists and private health professionals, but these groups are in the minority (BHF, 2010). Exercise Referral Schemes are heterogeneous, not only relating to reasons for referral and modes of delivery, but also in the supportive techniques incorporated alongside the schemes, such as motivational interviewing, self-determination theory and patient

only classes that provide supportive social networks (Moore *et al.*, 2013; Morton, Biddle and Beauchamp, 2008).

Despite the large number of ERS schemes, research has so far failed to establish the clinical and cost effectiveness of ERS to the point where the National Institute for Health and Care Excellence (NICE, 2006b) stated that ERS did not have sufficient evidence to support their use, unless part of a controlled trial. A key issue with regards to ERS is a lack of participant adherence, with recent studies reporting adherence rates ranging from 43-53% (Hanson *et al.*, 2013; Murphy *et al.*, 2012; Pavey *et al.*, 2012; Tobi *et al.*, 2012). In addition to low adherence rates, the effectiveness of ERS has been questioned in relation to primary outcomes such as PA increases, weight loss (Campbell *et al.*, 2015) and the ability to sustain PA increases following the scheme (Campbell et al., 2013) resulting in a return to pre scheme PA levels (Orrow *et al.*, 2012).

As a result of research being unable to establish the effectiveness of ERS, NICE (2014b) recommended future research should focus upon factors encouraging uptake and adherence, and identify any barriers preventing participation. These recommendations were based on the fact that there is limited research regarding the predictors of adherence/dropout, and the analysis of barriers to adherence.

Exercise Referral Schemes can be considered as complex interventions (Moore *et al.*, 2013). Complex interventions often attempt to address multiple components that may affect multiple outcomes (Moore *et al.*, 2014; Craig *et al.*, 2008). Therefore, a simple one-dimensional research approach may not suffice in understanding the process/mechanisms of why they are not as successful as first intended. As such, research may need to adopt mixed methods, encompassing both quantitative and qualitative approaches.

In response to the above recommendations relating to ERS, this thesis has the following aims:

- To investigate the adherence rate of a current ERS.
- To investigate what, if any, personal or referral characteristics are more likely to be associated with dropout or adherence.
- To investigate what, if any, personal or referral characteristics, including barriers to exercise predict dropout or adherence.
- Increase understanding of what the barriers and facilitators to ERS adherence are.
- To explore why the barriers and facilitators are present.

- To explore how to overcome/facilitate overcoming the barriers and enhance the facilitators.
- To design and implement an intervention, in the form of a pilot study to increase adherence.

The literature review (Chapter two) and the overarching methods (Chapter three) will provide specific rationale for the aims, by examining the current body of evidence in more detail. Chapter four will present the findings of a retrospective analysis of the South Tyneside ERS, followed by chapter five, where views of ERS participants will be qualitatively explored. Chapters six and seven will develop and implement a novel intervention, assessed using mixed methods. Finally, chapter eight concludes the findings of the thesis.

Chapter Two: Literature review

2.1 Literature review introduction

This chapter will introduce and discuss the definition of an ERS, followed by a review of the issues associated with heterogeneity within ERS. The literature review is composed of three sections, the first reviewing quantitative ERS research and the second reviewing qualitative ERS research, with the final section reviewing behaviour change interventions within ERS research.

2.1.1 The Exercise Referral Scheme: definition

Exercise Referral Scheme is a commonly used term within the literature and in practice. However, the term Exercise on Prescription (EoP) is often used by authors when describing similar PA interventions (Sørensen, Skovgaard and Puggaard, 2006; Edmunds, Ntoumanis and Duda, 2007). NICE (2014b) have described the four components that ERS consist of (see box 2.1).

Box 2.1 NICE (2014b) ERS components

1) An assessment involving a primary care or allied health professional to determine that someone is sedentary or inactive, and not meeting the UK PA guidelines.

2) A referral by a primary health care or allied health professional to a PA specialist or service.

3) A personal assessment involving a PA specialist or service to determine what programme or PA to recommend for their specific needs.

4) An opportunity to participate in a PA programme.

These components however, are specific to the UK. Within the literature, different authors have provided different definitions or descriptions of ERS. For example Sørensen, Skovgaard and Puggaard (2006) use the definition "a personalised secondary intervention located in primary healthcare setting involving GP's or other primary healthcare staff", whereas Campbell *et al.* (2015) considered ERS to be "the practice of referring a person from primary care to a qualified exercise professional who uses relevant medical information about the person to develop a tailored programme of PA usually lasting from 10 to 12 weeks". A definition encompassing or differentiating between the components of ERS/EoP appears to be lacking, suggesting a lack of consistency with the understanding and interpretation of ERS (Campbell *et al.*, 2015).

A systematic review by Campbell *et al.* (2013) revealed substantial heterogeneity in the nature and descriptions of ERS. This impacts upon the inclusion/exclusion of

papers within reviews, due to differing ERS definitions (Campbell *et al.*, 2013), and as not all studies included are UK based, may not relate to the NICE (2014b) description of ERS.

Although there is an inconsistency with the interpretation of the ERS/EoP definitions, a commonly described model and application in practice, as highlighted by Pavey *et al.* (2011c), involves the identification and referral of a sedentary individual, displaying at least one cardiovascular disease risk factor, to a third party service often located in a sports centre/leisure facility. The referral can be made by a GP or member of the primary care team, with the aim of increasing PA through a prescribed exercise programme that is tailored to the patient. Other descriptions have in addition, highlighted that ERS generally last 10-12 weeks, but can be as short as 4 weeks or as long as 24 weeks (BHF, 2010; Hanson *et al.*, 2013; Duda *et al.*, 2014). The British Heart Foundation review (BHF, 2010) made reference to the varying aims of different ERS, however emphasising that the main aim within the included reviews was to improve the health and wellbeing of the local population. Additionally, the BHF (2010) highlighted some of the secondary aims of ERS including: providing people with underlying medical conditions to become more active; to provide access to safe and effective exercise in a supervised environment; to equip patients with knowledge and skills to become more active; to raise awareness of PA benefits and to promote long-term behaviour change.

For the purposes of this thesis, the definitions of NICE (2014b), Pavey *et al.* (2011c) and Campbell *et al.* (2015) will be used to differentiate, and exclude schemes that do not provide the opportunity to participate in a programme, or are set within general practice only. For example, Arsenijevic and Groot (2017) included in their ERS systematic review, studies by Pfeiffer, Clay and Conatser (2001) and Knight, Stuckey and Petrella (2014), which provided a written exercise prescription only, without a programme to attend, or Sørensen, Skovgaard and Puggaard (2006) who excluded studies outside of General Practice, which does not reflect the UK description of ERS. The inclusion/exclusion of studies within this review will be discussed later.

2.1.2 Issues relating to ERS heterogeneity

While the concept of an ERS being able to include a wide range of individuals, for a wide range of conditions, for a wide range of reasons, from a wide range of referral sources appears attractive, this heterogeneity comes at a price, making analysis

and comparison between schemes, including their definition difficult (Pavey *et al.*, 2011a; Pavey *et al.*, 2011c; Pavey *et al.*, 2012; Campbell *et al.*, 2015).

Despite significant implementation over the last 30 years, research has not been able to establish the effectiveness of ERS, and this has been attributed, in part, due to the heterogeneity of the schemes (Pavey *et al.*, 2011a; Pavey *et al.*, 2011c; Pavey *et al.*, 2012; Campbell *et al.*, 2015). Therefore, attempting to understand the effectiveness of ERS is difficult to ascertain by asking "does it work" (Moore *et al.*, 2013), due to the complexity and variety of measures and outcome measures utilised within ERS. Littlecott *et al.* (2014) have suggested that complex interventions such as ERS need to be analysed beyond the realm of effectiveness alone and consider the mechanisms that may facilitate changes within context of the ERS. This begins to highlight the complexity of understanding ERS and how various facets and interactions of an ERS may change depending on the context (i.e. what population, reasons for referral, modalities exercise) of individual schemes, indicating the difficulty in comparing such a heterogeneous area of research. However, before it is possible to discuss the complexities of ERS in detail, and the implications this has for the thesis methodology, it is important to review the ERS research so far and to summarise its key findings.

2.2 Literature review

The NICE (2014b) ERS recommendations were based upon two reviews. Campbell *et al.* (2013) (an update of Health technology Assessment by Pavey *et al.* (2011a)) who reviewed the clinical and cost effectiveness of ERS, and Morgan *et al.* (2013) who reviewed factors influencing referral, attendance and successful completion of schemes. Since publication of the NICE (2014b) guidelines, these works have been republished (Campbell *et al.*, 2015) or updated (Morgan *et al.*, 2016). Other systematic reviews have focused on predictors of adherence (Pavey *et al.*, 2012), ERS performance within specific disorders (Rowley *et al.*, 2018), or psychosocial factors associated with adherence, using quantitative and qualitative research (Eynon *et al.*, 2019). At the beginning of the thesis the papers informing the NICE (2014b) guidelines were reviewed, including the reference list of each, gaining an overview of the current literature. Following this, regular searches of electronic databases, including PubMed, CINHAL, Medline, Web of science and Google Scholar were conducted to gain relevant literature as the thesis progressed. The aforementioned systematic reviews, plus relevant literature identified during the

database searches are used to inform the literature review. During the editing of this thesis (June 2019), a "review of reviews" was published (Shore *et al.*, 2019), that used a robust search strategy to identify the systematic reviews of ERS. Adoption of this strategy did not reveal any new reviews not already covered in this current literature review. The first part of the literature review below will focus on quantitative research, this will be followed by qualitative research findings, and the final section will consider both qualitative and quantitative in relation to Behaviour Change Techniques within ERS.

2.3 Quantitative ERS research

The literature review revealed a range of quantitative ERS studies, including randomised controlled trials (RCT) and observational studies, focusing on uptake and adherence, clinical effectiveness and cost effectiveness. The literature review will discuss these, with an emphasis on uptake, adherence and clinical effectiveness. Cost effectiveness will be referred to, however will not be a focus of this review, as it does not feature as a key component of this thesis. This quantitative section investigates ERS outcomes, however, does not review the underpinning mechanisms to explain the findings. The following section provides an overview of the papers included within this review. Table 2.1 provides a list of all included papers.

Prior to Pavey *et al.* (2011a), five key systematic reviews of ERS were published. Morgan (2005), Sørensen, Skovgaard and Puggaard (2006), and NICE (2006b) included RCTs only, whereas Gidlow *et al.* (2005) and Williams *et al.* (2007) also included non-RCTs, observational and qualitative studies. All reviews employed a narrative method of data synthesis, with Williams *et al.* (2007) employing a narrative method with a meta-analysis using five of the 18 included studies. The five reviews included 22 RCTs and 13 non-RCTs.

Table 2.1 Overview of papers included within literature review

Review	New papers included, not previously included in prior reviews. *= RCT	Sibling papers
Morgan (2005)	King *et al.* (1991)*; Marcus and Stanton (1993)*; McAuley *et al.* (1994)*; Munro *et al.* (1997); Bull and Jamrozik (1998)*; Dunn *et al.* (1998)*; Stevens *et al.* (1998)*; Taylor, Doust and Webborn (1998)*; Dunn *et al.* (1999)*; Goldstein *et al.* (1999)*; Harland *et al.* (1999)*; Naylor *et al.* (1999)*; Halbert *et al.* (2000)*; Simons-Morton *et al.* (2001)*; Dubbert *et al.* (2002)*; Lamb *et al.* (2002)*; Elley *et al.* (2003)*; Petrella *et al.* (2003)*; Harrison, Roberts and Elton (2005)*; Jimmy and Martin (2005)*; Marshall, Booth and Bauman (2005)*; Isaacs *et al.* (2007)*	
Sørensen, Skovgaard and Puggaard (2006)		
NICE (2006b)		
Gidlow *et al.* (2005)	Lord and Green (1995); Hammond, Brodie and Hundred (1997); Cochrane and Davey (1998); Jackson *et al.* (1998); Martin and Woolf-May (1999); Damush *et al.* (2001); Robertson *et al.* (2001a); Robertson *et al.* (2001b); GGHB (2004); Dugdill, Graham and McNair (2005); Harrison, McNair and Dugdill (2005); Fritz *et al.* (2006); Dinan *et al.* (2006).	
Williams *et al.* (2007)		
Pavey *et al.* (2011a)	Edmunds, Ntoumanis and Duda (2007); Gidlow *et al.* (2007); Crone *et al.* (2008); Gusi *et al.* (2008)*; James *et al.* (2008); Morton, Biddle and Beauchamp (2008); Sørensen *et al.* (2008)*; Sowden *et al.* (2008); James *et al.* (2009) ; Jolly *et al.* (2009)*; Roessler and Ibsen (2009).	Pavey *et al.* (2011c); Anokye *et al.* (2011); Pavey *et al.* (2012).
Campbell *et al.* (2013)/ Campbell *et al.* (2015)	Murphy *et al.* (2012)*	Edwards *et al.* (2013); Moore *et al.* (2013)
	Tobi *et al.* (2009)	Tobi *et al.* (2012)
	Leijon *et al.* (2011); Hanson *et al.* (2013); Duda *et al.* (2014)*	N/A
Arsenijevic and Groot (2017)	Shepich, Slowiak and Keniston (2007) ; Romé *et al.* (2009)*; Sorensen *et al.* (2011); Gademan *et al.* (2012)*; Livingston *et al.* (2015)*	N/A
Rowley *et al.* (2018)	Mills *et al.* (2013); Littlecott *et al.* (2014)* Webb, Thompson and Ruffino (2016)	N/A
	Tobi, Kemp and Schmidt (2017); Parretti *et al.* (2017); Rowley *et al.* (2020) ; Wade *et al.* (2019)	N/A
Shore *et al.* (2019)	Nil new papers	N/A

The Pavey *et al.* (2011a) review identified a further three RCTs and eight observational studies. The findings from the original Pavey *et al.* (2011a) review were developed into three papers, specifically relating to the effects of ERS on PA and health outcomes (Pavey *et al.*, 2011c), analysis of ERS cost effectiveness

(Anokye *et al.*, 2011) and the levels and predictors of uptake and adherence (Pavey *et al.*, 2012), which included an additional study (Murphy *et al.*, 2010). Using an update of the search strategy by Pavey *et al.* (2011a), Campbell *et al.* (2013), which was republished as, and will be referred to forthwith as Campbell *et al.* (2015), identified and included two additional RCTs and three observational studies. One of the RCTs (Murphy *et al.*, 2012) developed two sibling studies assessing cost effectiveness (Edwards *et al.*, 2013) and reported mixed methods evaluation (Moore *et al.*, 2013), while one of the observational reports (Tobi *et al.*, 2009) was republished as Tobi *et al.* (2012).

Following these reviews, Orrow *et al.* (2012) and Arsenijevic and Groot (2017) have published ERS systematic reviews. Orrow *et al.* (2012) did not include any studies not already covered within the previous reviews and only three of the included studies were ERS. Arsenijevic and Groot (2017) included 37 studies, containing 24 RCTs, eight longitudinal studies, three mixed methods studies and two case studies. Of these 37 studies, various had been excluded by Pavey *et al.* (2011a) as they did not meet the criteria of being an ERS, typically not using a third party provider or not including primary care referral, or by Campbell *et al.* (2015), as they were not RCTs. On inspection by this author (MK), other studies included were pilot studies (Galaviz, Levesque and Kotecha, 2013; Hawkins *et al.*, 2014) or not ERS (Pfeiffer, Clay and Conatser, 2001; Knight, Stuckey and Petrella, 2014), therefore not included within this literature review. However, five studies included by Arsenijevic and Groot (2017) were reviewed by MK, and included in this review.

Rowley *et al.* (2018) conducted a systematic review, with the aim of updating the Pavey *et al.* (2011b) study, and focusing upon the effects of ERS on specific disorders (Cardiovascular, Mental health and Musculoskeletal). The search strategy employed, placed no restrictions on publication dates for MSK disorders, but limited Cardiovascular and Mental health search to post 2011, to avoid replication of, and add to the Pavey *et al.* (2011b) study. The study included Rouse *et al.* (2011) and Mills *et al.* (2013) which had been excluded by Campbell *et al.* (2015) as they were not an RCT, plus additional studies by Littlecott *et al.* (2014) and Webb, Thompson and Ruffino (2016). The quantitative studies by Littlecott *et al.* (2014), Webb, Thompson and Ruffino (2016) and Mills *et al.* (2013) will be included within the quantitative section, however Rouse *et al.* (2011) will not, as on inspection, it investigated the relationships between motivation, social environment and mental health or intentions to be physically active prior to commencing an ERS. Rowley *et*

al. (2018) also included studies by Hillsdon *et al.* (2002) and Chalder *et al.* (2012), however, following review, neither were considered an ERS when using the definition employed within this thesis.

A final literature search was conducted prior to the completion of the thesis, revealing one retrospective analysis (Tobi, Kemp and Schmidt, 2017) and one data re-analysis study (Parretti *et al.*, 2017), two meta-analyses using the National Referral Database (NRD) (Rowley *et al.*, 2020; Wade *et al.*, 2019) which have been included in this literature review, and as aforementioned, a systematic review of reviews by Shore *et al.* (2019) which did not reveal any new studies.

2.3.1 Uptake and Adherence

Two of the most prevalent outcome measures reported within the ERS literature relate to uptake and adherence. However, the definitions of each are also another aspect of ERS that is heterogeneous. The definitions of each can differ between authors and are exemplified with the systematic reviews by Pavey *et al.* (2012) and Campbell *et al.* (2015). Pavey *et al.* (2012) defined uptake as attendance at the initial consultation with the exercise professional, or attendance at ≥1 session, and adherence as the number of individuals who completed a minimum set number of exercise sessions (75% of available sessions). Whereas Campbell *et al.* (2015) defined uptake as initial attendance, take up or enrolment following referral, and adherence as continued participation in the scheme. This highlights the difficulty of comparing research within the ERS literature, as application of each definition to the same data could potentially produce different results.

Despite employing different definitions, the systematic reviews by Pavey *et al.* (2012) and Campbell *et al.* (2015) identified a range of studies examining uptake and adherence in ERS. These studies included RCTs and Observational studies from the last 25 years. They describe a wide range of variance between studies in terms of reported uptake and adherence. Pavey *et al.* (2012) reported uptake ranging from 28-100%, representing an uptake proportion of 72.27% (66% within observational studies and 81% in RCTs), with Campbell *et al.* (2015) also reporting a wide range of uptake (35-100%). Adherence was also wide ranging, Pavey *et al.* (2012) reported adherence to range from 12-93% (representing 48.09% adherence proportion (49% within observational studies and 43% within RCTs)) and Campbell *et al.* (2015) reporting 21.5-86%. The differences in outcomes between the reviews

is not related to the differences in definitions of uptake and adherence alone, but due to Campbell *et al.* (2015) excluding the data from observational studies and including an additional RCT (Murphy *et al.*, 2012), which reported 85% uptake and 43.8% adherence. While Campbell *et al.* (2015) only included RCTs for analysis, it did report the findings from three observational studies (Tobi *et al.*, 2009; Leijon *et al.*, 2011; Hanson *et al.*, 2013) that were not included or available to Pavey *et al.* (2012). Leijon *et al.* (2011) reported relatively high adherence (72%), however this was calculated by recording participants' responses to the question "Have you adhered to your physical activity prescription?". This therefore must be interpreted with caution, as this could be interpreted in a number of ways and does not relate well to the definitions of adherence used within the literature. However, Tobi *et al.* (2012) and Hanson *et al.* (2013) measured attendance in order to calculate adherence, reporting 45% adherence, and 81% uptake with 42.9% adherence, respectively.

Prior to Pavey *et al.* (2012) and Campbell *et al.* (2015), Gidlow *et al.* (2005) reported uptake ranging from 23-60%, and while commenting on the inconsistent methods of adherence calculation within the included studies, reported this to range from 20-56%. Williams *et al.* (2007) reported that up to one third of patients did not take up schemes, with a low adherence rate ranging between 12-42%.

Most recently, Rowley *et al.* (2018) and Shore *et al.* (2019) have conducted a systematic review and a "review of reviews" that have considered uptake and adherence. Rowley *et al.* (2018) did not include any studies that had not already been included within previous reviews, with the exception of Mills *et al.* (2013) (reporting 57% adherence, within a mixed methods study), which was not included or commented on by Campbell *et al.* (2015) as it was not an RCT.

The "review of reviews" by Shore *et al.* (2019) focusing upon ERS uptake, attendance and adherence, added a systematic review by Arsenijevic and Groot (2017), but otherwise included reviews already discussed. Shore *et al.* (2019) reported that uptake within the literature maintained a wide range of variance (35-85%), and 12-86% adherence (termed attendance by the authors). Although the Arsenijevic and Groot (2017) study was included in the review, it did not report overall adherence levels, as it conducted a meta-analysis to investigate the impact of programme characteristics on adherence, therefore providing limited insight in terms of overall adherence. The definition of adherence employed in the study ("the

patients active choice to follow the medical recommendation instead of passive compliance" or adherence levels of people completing more than 80% of physical activity referral service (PARS) activities) does not appear to be congruent with the definitions employed by other studies. Additionally, on inspection, a range of the studies included could not be considered as ERS, when compared against the NICE (2014b) ERS components, therefore the findings should be interpreted with caution. The most recent publication investigating dropout, reported findings in concordance with the majority of previous studies, where 55.3% of the cohort adhered to the 12 week programme (Wade *et al.*, 2018). Table 2.2 provides and overview of uptake and adherence.

*Table 2.2 Summary of Uptake and Adherence within included studies. *Range of scheme duration included in systematic review*

Paper	Uptake	Adherence	Scheme duration
Gidlow *et al.* (2005)	23-60%	20-56%	10-14 weeks*
Williams *et al.* (2007)	66%	12-42%.	10-12 weeks, one study 4 months, one two years*
Leijon *et al.* (2011)		72%	3-month followup
Murphy *et al.* (2012)	85%	43.8%	16 weeks
Pavey *et al.* (2012)	28-100%, uptake proportion of 72.27% (66% within observational studies and 81% in RCTs)	12-93% (representing 48.09% adherence proportion (49% within observational studies and 43% within RCTs))	NA
Tobi *et al.* (2012)		45%	20-26 weeks
Hanson *et al.* (2013)	81%	42.9%	24 weeks
Mills *et al.* (2013)		57%	26 weeks
Campbell *et al.* (2015)	35-100%	21.5-86%	10-16 weeks, one study 4 months, one study 6 months*
Wade *et al.* (2018).		55.3%	12 weeks
Shore *et al.* (2019)	35-85%	12-86%	N/A

The literature investigating uptake and adherence has reported a wide range of outcomes. However, the mean pooled results of Pavey *et al.* (2012), and subsequent studies by Tobi *et al.* (2012), Hanson *et al.* (2013) and Wade *et al.* (2018) for example, have reported adherence to typically be around 50%. The variability in reported uptake and adherence, with the relatively underwhelming levels of each, presents three key issues. Firstly, taken at *prima facie*, a wide range of reported uptake and adherence suggests that ERS are not able to produce consistent data or outcomes. The heterogeneity of ERS in terms of delivery/content has been well established (BHF, 2010) and could explain why the range of reported uptake/adherence is wide across studies. Alternatively, the wide range of uptake/adherence could highlight that not all ERS are equal, and therefore gain different outcomes. If this is the case, it suggests there is potentially unwarranted

variation, a phenomenon that is seen as a priority to reduce within healthcare (Wennberg, 2011).

Secondly, a wide range of reported uptake/adherence suggests a lack of consensus or consistent application of the definition and measurement of uptake/adherence. None of the reviews included in Shore *et al.* (2019), which are some of the most influential/cited reviews on ERS, detail the type of exercise that is prescribed, or the extent to which participants actually adhere to the prescribed exercise. Typically, attendance at a final assessment has been considered as being adherent, where in reality, a participant could have minimal attendance over the course of an ERS, but attend the final assessment and be recorded as being adherent (Shore *et al.*, 2019). A lack of agreement, or shared understanding of the definition of adherence, limits the ability to report the extent of how adherent participants are to exercise, what is delivered within ERS, and as a consequence, severely limits the ability to draw conclusions about ERS effectiveness (Shore *et al.*, 2019). Pavey *et al.* (2012) concluded that ERS research would benefit significantly from a consensus being reached regarding the definitions of uptake and adherence, however, this advice does not seem to have been heeded. The impact this has on this thesis will be discussed within chapter four.

Third and finally, ERS outcomes depend on attendance and adherence (Gidlow *et al.*, 2005), regardless of the measures used. If only 50% of participants generally adhere in any type of capacity, this suggests that for half of all participants, any potential benefits are negated and will impact on any potential effectiveness. Limited uptake and adherence is a clear issue within ERS, which as discussed, may impact on any potential benefits or outcomes. As adherence is a key focus for this thesis, this in conjunction with uptake will be evaluated further in this review, then will be followed by a review of outcome measures within ERS research.

The measurement of, and focus on adherence is not without criticism. Attendance can only be considered as a proxy measure of exercise adherence (Campbell *et al.*, 2015), particularly if attending one or two sessions per week is unlikely to provide the minimum recommended levels of exercise alone. However, adherence at present, has been considered within the majority of ERS research, and has so far been discussed as a total figure, without considering the impact of age, gender or other personal and referral characteristics. Each of these components in the context of uptake and adherence will be discussed in the following sections.

Uptake and adherence by gender

While the reported levels of uptake and adherence is typically variable, there is slightly more consistency in uptake when related to gender. Across the majority of included studies, female uptake to ERS is generally higher compared to males. Within the reviews by Pavey *et al.* (2011a), Pavey *et al.* (2012) and Campbell *et al.* (2015), five studies reported that females are more likely to take up ERS (Lord and Green, 1995; Sowden *et al.*, 2008; Murphy *et al.*, 2012; Hanson *et al.*, 2013; James *et al.*, 2008). Other studies not included in the reviews have also supported this finding, (Gidlow *et al.*, 2005; Tobi *et al.*, 2012), however four studies have reported no relationship between ERS uptake and gender (Harrison, McNair and Dugdill, 2005; Gidlow *et al.*, 2007; Edmunds, Ntoumanis and Duda, 2007; Wade *et al.*, 2018).

Data for adherence are less consistent, with being 'male' reported as a predictor of, or more likely to adhere in three studies (Dugdill, Graham and McNair, 2005; Gidlow *et al.*, 2007; James *et al.*, 2008), but no such association found in four studies (Lord and Green, 1995; Sowden *et al.*, 2008; James *et al.*, 2009; Hanson *et al.*, 2013). More recently, Tobi, Kemp and Schmidt (2017) reported no association with gender and adherence, while the most recent review by Shore *et al.* (2019), was unable to provide new insight into adherence, and questioned why there is such limited and poorly reported data on the topic.

Campbell *et al.* (2015) reported (in Table 23), that there was a negative association between being male and adherence in the Damush *et al.* (2001) study, and females were more likely to adhere than males in Leijon *et al.* (2011). However, on inspection, Damush *et al.* (2001) recruited females exclusively, whereas Leijon *et al.* (2011) reported a non-significant difference in adherence between males and females, although in terms of percentage differences, females had higher adherence levels. Therefore, the findings should be interpreted with caution, particularly in light of the aforementioned issues regarding the method of measuring adherence by Leijon *et al.* (2011). Finally, Campbell *et al.* (2015) in Table 23, highlighted that there was a positive association between males and adherence in Murphy *et al.* (2012). On inspection, Murphy *et al.* (2012) did not report adherence by gender, therefore the reporting within Campbell *et al.* (2015) should be taken with caution, as it may be referring to Moore *et al.* (2013), a sibling paper using the same data, which reported that males were less likely to uptake, but more likely to adhere.

Uptake and adherence by age

Age and the relationship to uptake and adherence is one of the few trends reported within ERS research. Eleven papers have reported that increasing age is related to increased uptake, or both uptake and adherence. Increasing age has been reported to be related to increased uptake and adherence (Dugdill, Graham and McNair, 2005; Gidlow *et al.*, 2007; Sowden *et al.*, 2008; Hanson *et al.*, 2013). However, other studies have reported that increasing age is related to increased adherence, but not uptake (Lord and Green, 1995; James *et al.*, 2008; James *et al.*, 2009; Leijon *et al.*, 2011; Tobi *et al.*, 2012; Moore *et al.*, 2013), while Wade *et al.* (2018) reported that younger participants were most likely to dropout. These findings are based on varying statistical analysis. Dugdill, Graham and McNair (2005) reported descriptive statistics, highlighting that the highest percentages of uptake and adherence were within older groups of participants, while Lord and Green (1995) reported compliance rates (i.e. adherence) being higher in participants of 55 and over. All of the other included studies utilised logistic regression to assess the relationship between age and adherence/uptake.

Not all studies have reported a link between increasing age and uptake/adherence (Taylor, Doust and Webborn, 1998; Martin and Woolf-May, 1999; Damush *et al.*, 2001; Isaacs *et al.*, 2007), although Isaacs *et al.* (2007) did report that those aged between 40-49 were more likely to participate in the ERS than those aged over 70 years, indicating some relationship between age and adherence. Although some studies have reported that there is no association with age and uptake/adherence, none have reported that a reduction in age increases adherence.

It is noteworthy to mention that Campbell *et al.* (2015) included Murphy *et al.* (2012) as a reference, when stating that increasing age strongly predicted uptake and adherence. However, following review by the author, Murphy *et al.* (2012) assessed cost effectiveness relating to age, without reporting on the relationship between age, uptake or adherence, and Campbell *et al.* (2015) could be referring to a sibling paper (Moore *et al.*, 2013) that reported an association with increasing age and adherence. Participant age in association with uptake and adherence, is one of the most commonly reported findings within ERS research. Increasing age is typically associated with increased uptake and adherence, suggesting that ERS could be more suited for older participants. Despite this association being commonly reported on, no research appears to have attempted to, or successfully explained why this association is present. Addressing this gap within the literature would provide

valuable insight into why this association is present, and potentially provide ways of addressing the limited uptake/adherence in younger participants, or conversely, further support uptake/adherence in older participants.

Uptake and adherence by medical diagnosis/referral reason

Multiple studies (Pavey *et al.*, 2011a; Pavey *et al.*, 2012) have commented on the difficulty of compiling and analysing data regarding medical diagnosis and referral reasons in relation to ERS uptake and adherence (Campbell *et al.*, 2015). A key issue is the variance in medical condition or referral reason reporting (Pavey *et al.*, 2012).

Despite this, various studies (Pavey *et al.*, 2011a; Pavey *et al.*, 2012; Campbell *et al.*, 2015) have attempted to consider the relationship between medical conditions or reasons for referral and uptake/adherence, often through narrative overviews due to the variance of reporting within the literature. Comparing uptake and adherence between different medical conditions or referral reasons across studies is particularly difficult, not only due to the varying types of conditions recorded or reported on, but also due to the range of comparisons made within each study.

Referrals relating to mental health have been included in a range of studies, with some patterns emerging. Uptake has been reported as higher within mental health referrals (and participants with low physical fitness) compared to non-specific referrals (Harrison, McNair and Dugdill, 2005). However, other studies have not supported this finding. Participants referred for MSK conditions, obesity, and mental health or “other” (non-specified) conditions were less likely to uptake compared to cardiovascular referrals (James *et al.*, 2008), while Crone *et al.* (2008) reported reduced uptake in mental health referrals compared to referrals for physical health. In terms of adherence, Dugdill, Graham and McNair (2005) reported that mental health referrals were the lowest compared to all others, and only half compared to the highest category (post myocardial infarct referrals). Crone *et al.* (2008) also reported that mental health referrals adherence was lower, when compared to physical health referrals. Initial work by Tobi *et al.* (2009), later published as Tobi *et al.* (2012) did not find an association between mental health referrals and adherence, matching the findings of James *et al.* (2008). However, a further analysis of the Tobi *et al.* (2012) data (Tobi, Kemp and Schmidt, 2017), revealed that mental health referrals were more likely to dropout, compared to referrals relating to

physical health, a similar finding to Moore *et al.* (2013) where mental health referrals were less likely to adhere, compared to coronary heart disease referrals. Although James *et al.* (2008) and Tobi *et al.* (2012) reported no association between mental health and adherence, it appears that they are the only studies that have not linked mental health referrals with reduced adherence.

The focus of other analyses have varied. The relationship between MSK referrals/conditions on uptake and adherence has only been reported in a limited number of studies. Sowden *et al.* (2008) reported that participants with MSK referrals were more likely to uptake, compared to participants with diabetes or cardiovascular disease (CVD). However, diabetes referrals were less likely to adhere compared to those with CVD, when compared to those without diabetes or CVD, whereas participants with pulmonary conditions were less likely to adhere compared to cardiovascular conditions in James *et al.* (2009). Participants with MSK or endocrine disorders have been reported to have an increased likelihood of dropout, compared to a range of other conditions, including mental health referrals (Wade *et al.*, 2018). Other studies have investigated the relationship between health condition/diagnosis and referral reasons with uptake and adherence. Taylor, Doust and Webborn (1998) reported that participants referred for issues relating to obesity, recorded higher uptake than referrals for smoking, however there was no impact on smoking status, weight or hypertensive referrals on adherence. Lamb *et al.* (2002) did not report any difference in adherence when assessing the PA profile of participants, whereas Hanson *et al.* (2013) reported that referrals with metabolic/endocrine conditions as secondary referral reasons were predictors of uptake, while having a BMI of 30kg/m^2 was a predictor of dropout.

Due to the inconsistent reporting of medical conditions/referral reasons, including the type of comparisons employed by the included studies, it is very difficult to conclude the findings clearly. However, it appears that those referred with, or for a mental health condition, uptake and adhere less compared to other conditions/referral reasons.

Uptake and adherence by socioeconomic factors/status or psychosocial factors

The impact of socioeconomic factors, ethnicity or psychosocial factors has been reported on, however they have been sparsely investigated, and in common with many areas of ERS research, are subject to inconsistent reporting and findings.

The relationship between deprivation and uptake/adherence has been investigated in a limited number of studies. Harrison, McNair and Dugdill (2005) reported that participants with respiratory conditions, from the most deprived classification, were more likely to uptake than those from the least deprived classification. However this finding is unique, as other studies have reported that increased deprivation is associated with less uptake or adherence. Gidlow *et al.* (2007) reported reduced uptake in the most deprived areas and residents of rural villages, but no association between deprivation, overall adherence, rurality or the original referrer. Hanson *et al.* (2013) also investigated deprivation and reported that greater deprivation predicted dropout by 12 weeks, but not uptake or dropout between 12 and 24 weeks.

According to Campbell *et al.* (2015), Murphy *et al.* (2012) reported that the most deprived were less likely to uptake, though this was not a predictor of uptake, and higher deprivation predicted dropout, with car ownership a predictor of uptake and adherence. On inspection of Murphy *et al.* (2012), this was not reported. However, in the sibling (Moore *et al.*, 2013) study, reduced uptake and adherence was observed with higher levels of deprivation, though only uptake (not adherence) was predicted by higher deprivation, while car ownership was a predictor of both uptake and adherence. Campbell *et al.* (2015) also stated that James *et al.* (2008) reported patients from the most deprived areas were less likely to uptake, and deprivation was also a predictor for non-adherence. Following inspection of James *et al.* (2008), no variables relating to deprivation were reported. A study by the same lead author (James *et al.*, 2009), did consider the "socioeconomic position" of participants by placing them into one of eight social classes based on occupation. However, the analysis did not find any relationship with adherence, a finding supported by Tobi, Kemp and Schmidt (2017) and Sowden *et al.* (2008), both of whom also reported no association with uptake.

While the review by Campbell *et al.* (2015) is informative, aspects of the referencing have been inconsistent, and do not match the original report (Campbell *et al.*, 2013). For example, the 2013 version referenced Morton, Biddle and Beauchamp (2008) and not Gidlow *et al.* (2007), as reporting the most deprived being less likely to uptake, and Morton, Biddle and Beauchamp (2008) was referenced instead of James *et al.* (2008) when stating deprivation was a predictor for not adhering to the ERS. Finally, Duda *et al.* (2014) and Crone *et al.* (2008) were referenced instead of Murphy *et al.* (2012) and James *et al.* (2008) when stating that no association with deprivation and uptake was reported. Following review of these three additional

papers (Morton, Biddle and Beauchamp, 2008; Crone *et al.*, 2008; and Duda *et al.*, 2014) none studied the relationship between uptake and adherence, and therefore did not inform this review.

Ethnicity has been assessed in one report and three studies, all reporting no association with uptake and adherence (Damush *et al.*, 2001; Tobi *et al.*, 2009; Tobi *et al.*, 2012; Tobi, Kemp and Schmidt, 2017). Some studies have investigated psychosocial factors related to uptake and adherence. Jones *et al.* (2005) reported adherence was lower in participants with higher expectations of change, with Morton, Biddle and Beauchamp (2008) finding higher adherence with participants recording higher levels of self-determination. However, this was not supported by Edmunds, Ntoumanis and Duda (2007), as no association with adherence and any psychological measures was found.

Due to the paucity of research investigating the impact of factors relating to socioeconomic or psychosocial status, and the inconsistent findings within the available studies, it is difficult to conclude if an association between uptake/adherence and socioeconomic or psychosocial status exists, and requires further investigation.

2.3.2 Clinical effectiveness

The first part of this quantitative literature review has focused upon uptake and adherence due to the relatively low levels of each and prevalence of research in this field. However, not all ERS research has focused on these metrics. Various studies have attempted to assess the effectiveness of ERS, and in some instances have highlighted the impact of limited uptake and adherence on effectiveness. This section of the quantitative literature review will focus upon the research relating to the effectiveness of ERS.

The outcome measures employed to investigate effectiveness, reflecting the issues across ERS research, have been inconsistently measured and reported. Common outcome measures related to PA for example, are reported via a variety of measures, including self-reported measures, 7-day physical activity recall (7D-PAR) or Godin leisure time exercise questionnaire (GLTEQ), making comparison between studies difficult, particularly in light of the heterogenic nature of the ERS themselves. Similar issues arise when considering outcomes related to physical, physiological or psychological outcomes. This limits the ability to assess effectiveness beyond a descriptive nature, or in some limited instances, with meta-analysis. If meta-

analyses are employed, they consider the effect of ERS on a pooled population, including conditions that have different aetiologies and symptoms, without considering the effectiveness of the ERS for specific conditions, limiting the ability to inform guidelines or management (Rowley *et al.*, 2018). Additionally, due to the heterogenic nature of the referral reasons/conditions admitted into ERS, meta-analysis becomes difficult and assessments such as cost effectiveness are based upon a limited number of conditions such as CHD, Stroke or Diabetes for example (Anokye *et al.*, 2011), therefore do not consider MSK or mental health conditions which make up a sizable proportion of ERS referrals. Despite these issues, the following sections will review the evidence investigating the clinical, then the cost effectiveness of ERS.

Physical activity

One of the most reported outcome measures is PA levels (Campbell *et al.*, 2015). This is not surprising as one of the main reasons ERS have been and are commissioned, is to increase PA levels. One of the earliest systematic reviews assessing PA within ERS (Morgan, 2005) reported that PA levels marginally increased with ERS, however, the included studies suffered from limited methods of measuring PA, most relying on self-reported measures/recall of activity. Sorensen, Skovgaard and Puggaard (2006) reported inconsistent PA changes, as four of the included studies did not report any significant changes in PA, however, concluded that ERS can support a moderately positive effect on PA in 10% of participants. Utilising a meta-analysis, Williams *et al.* (2007) reported similar findings, with ERS significantly increasing PA. A numbers needed to treat analysis revealed that 17 sedentary participants were required to be referred for one to become moderately active. Following this, Pavey *et al.* (2011b) conducted a systematic review and meta-analysis, consisting of the following publications from 8 trials (Taylor, Doust and Webborn, 1998; Taylor and Fox, 2005; Stevens *et al.*, 1998; Harrison, Roberts and Elton, 2005; Isaacs *et al.*, 2007; Sørensen *et al.*, 2008; Gusi *et al.*, 2008; Jolly *et al.*, 2009; Murphy *et al.*, 2010). The study assessed PA changes, in addition to blood pressure, serum lipid, weight, obesity respiratory function and diabetes control. Physical activity changes were reported, but did not include objective PA measures and compared ERS versus normal care, ERS versus alternative PA interventions, and finally, ERS versus ERS with behaviour change interventions. The analysis revealed weak evidence supporting ERS to gain a short-term increase in PA,

compared to usual care, but could not find any evidence supporting ERS over alterative PA interventions or ERS with behaviour change interventions.

Campbell *et al.* (2015) re-analysed the data by Pavey *et al.* (2011b) by including Murphy *et al.* (2012) and where possible, Duda *et al.* (2014). The re-analysis, when comparing ERS to normal care, revealed a reduced relative risk of achieving 90-150 minutes per week of PA, from 1.16 (95% CI 1.03-1.30) in Pavey *et al.* (2011b) to 1.08 (95% CI 1.00-1.17), and the total minutes of activity when pooling data from Isaacs *et al.* (2007) and Murphy *et al.* (2012) revealed a significant difference of 55.10 minutes between ERS and normal care. Interestingly, Murphy *et al.* (2012) reported that increases in PA were dependent on adherence, and that referrals for CHD significantly increased PA levels, however, this was not the case for mental health or a combination of CHD and mental health referrals. The findings comparing ERS and alternative PA intervention, or ERS compared to ERS with theory-based behaviour change interventions remained the same within the re-analysis, revealing no significant difference. However, Duda *et al.* (2014) reported a significant increase in the number of participants from both the ERS and ERS plus Self-Determination Theory (SDT) groups attaining at least 150 mins of moderate activity per week at 3 and 6 months follow-up, suggesting that ERS are capable of increasing PA levels.

The systematic review by Rowley *et al.* (2018) investigated the effects of ERS on Cardiovascular, Mental health and Musculoskeletal disorders, and in terms of PA outcomes, did not find any new studies not already discussed within this review, aside from Chalder *et al.* (2012). Chalder *et al.* (2012) reported that the intervention group increased PA compared to usual care for participants with mental health conditions. However, this study did not appear to use an ERS for the intervention aligned to the NICE (2014b) description, and did not exclude participants in the control group for attending “exercise on prescription” schemes, therefore these findings provide limited insight specifically for ERS.

The most recent study into PA (Rowley *et al.*, 2020), used the National Referral Database to investigate if ERS were associated with an increase in PA. The NRD was developed in response to the NICE (2014b) recommendations, developing a system to collate ERS data and has been developed by Steele *et al.* (2019), with 19 ERS sites, including 24,086 participants. Using this database Rowley *et al.* (2020), were able to include 5246 participants across 12 schemes, and assess changes to the self-reported International Physical Activity Questionnaire (IPAQ) to determine

METS (minute/week). The findings revealed pre ERS MET-minutes/week of 676 (classified as moderately active), making a significant increase of 540 MET-minutes/week, however this increase resulted in no change in classification of being moderately active. The authors contextualised this change, in relation to the purported dose-response of MET-mins/week change of 500-1000 (Nelson *et al.*, 2007), which this study marginally gained. Rowley *et al.* (2020) suggested that participants categorised as inactive, may see more meaningful changes in PA, due to the steeper shape at the lowest end of dose-response curve (i.e. transitioning from “no” or ‘low” levels of PA to “moderate), citing Wasfy and Baggish (2016) in support of this. However, the meta-regression conducted by Rowley *et al.* (2020), revealed that participants categorised as “low”, were not associated with a change in PA levels, while participants on the whole, remained moderately active. The authors concluded that the schemes within the NRD increased PA levels significantly, however, it was not clear how meaningful the changes were.

The majority of studies measuring PA are reliant of aspects of self-reporting, which is subject to issues such as recall bias (Ainsworth *et al.*, 2012) and self-report bias (Campbell *et al.*, 2015), therefore limits the ability to make clear conclusions about the effect of ERS of PA. Therefore, the findings relating to PA should be interpreted with caution.

Weight/BMI

Pavey *et al.* (2011b) investigated weight and obesity changes, however was unable to report any BMI or body fat changes within the meta-analysis, although one study (Taylor, Doust and Webborn, 1998) did report lower body fat in ERS participants compared to normal care. The re-analysis of the data by Campbell *et al.* (2015) did not add new weight/BMI data, therefore the conclusions remained unchanged. Duda *et al.* (2014) reported that standard ERS participants compared to ERS plus SDT, significantly decreased BMI at 6 months follow-up, albeit by a clinically small amount. Rowley *et al.* (2018) included Mills *et al.* (2013) and Webb, Thompson and Ruffino (2016), which were not included in previous reviews. Mills *et al.* (2013), using the James *et al.* (2009) data, reported that adherent participants were significantly more likely to reduce body mass, with 33% of adherent participants doing so. Webb, Thompson and Ruffino (2016), reported that ERS participants significantly reduced BMI form baseline to week 8, when compared with a walking group. However, this study was based upon an ERS cohort of only 11, and should be interpreted with

caution. Wade *et al.* (2019) utilised the NRD to assess the impact of ERS on a range of outcomes, including BMI. Across 11 schemes, including 4,834 participants, a statistically significant change was seen, however this change of 0.55kg.m^2, is unlikely to be clinically meaningful.

Physiological outcomes

Pavey *et al.* (2011b) reported no difference in blood pressure, serum lipids or respiratory function across any of the comparisons made within the meta-analysis, and the updated review by Campbell *et al.* (2015) corroborated these findings. The systematic review by Rowley *et al.* (2018) included Mills *et al.* (2013) and Webb, Thompson and Ruffino (2016), both reporting significant reductions in blood pressure. Mills *et al.* (2013) reported that 49.2% of adherent participants reduced blood pressure, and regression analysis indicated that this was linked to adherence, while those reducing bodymass had an increased likelihood of reducing blood pressure. Webb, Thompson and Ruffino (2016) observed significant improvements in total cholesterol, LDL cholesterol and heart rate, within an ERS, when comparing changes from baseline. However, with the exception of heart rate, this finding was also seen within a walking group as a comparator, and was obtained from only 11 participants.

Wade *et al.* (2019), using 4,287 participants from nine ERS within the NRD reported there was no significant change in resting heart rate. However systolic blood pressure (assessed over 11 schemes and 7,389 participants) and diastolic blood pressure (assessed over 11 schemes and 7,451 participants) significantly decreased, though the clinical meaningfulness of the change was questionable.

Mental health/Psychological wellbeing

Pavey *et al.* (2011b) reported reductions in depression, but not anxiety when comparing ERS to usual care. However, Pavey *et al.* (2011b) concluded that there was no consistent evidence favouring ERS in terms of psychological wellbeing or quality of life measures. Murphy *et al.* (2012) reported a reduction in anxiety and depression in mental health referrals, or a combination of mental health and CHD referrals in ERS compared to normal care. While EQ-5D scores were higher in the ERS group, this was not statistically significant. Campbell *et al.* (2015) did not include any additional studies, therefore supported the conclusion of Pavey *et al.* (2011b). Duda *et al.* (2014) reported that ERS and ERS plus SDT participants

significantly improved anxiety and depression levels at three and six months follow-up, though there was no difference between each group. Littlecott *et al.* (2014) a sibling paper from Murphy *et al.* (2012), reported an improvement in autonomous motivation and social support (from friends and family) for ERS participants, at 6 months follow-up.

Wade *et al.* (2019), including 3 schemes and 1,625 participants from the NRD, assessed changes to the Short Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS), and reported a significant improvement. However, the authors questioned the findings, as one scheme was statistically influential, although when it was removed from analysis, the data remained significant. The same study investigated the World Health Organisation Well-Being Index (WHO-5), the Exercise Related Quality of Life Scale (ERQoL) and the Exercise Self Efficacy Scale (ESES). WHO-5 improved significantly, though not meaningfully, ERQoL and ESES also improved significantly, though both measures lack research defining what a meaningful change consists of. At present, the evidence supporting ERS to improve mental health/wellbeing appears to be limited and inconsistent.

2.3.3 Financial/cost effectiveness

The financial or cost effectiveness of ERS has been assessed across a limited number of studies. Prior to Pavey *et al.* (2011a), two systematic reviews (Sørensen, Skovgaard and Puggaard, 2006; Williams *et al.*, 2007) considered the cost effectiveness of ERS and one (NICE, 2006a) considered the evidence for ERS cost effectiveness. The findings were inconsistent, NICE (2006a) included a range of studies focused on PA increases, not ERS exclusively, with studies finding ERS to be cost effective, more costly and more effective, or more costly and equally effective compared to other interventions. Sorensen, Skovgaard and Puggaard (2006) reported that ERS was cost effective compared to usual care within one study, while Williams *et al.* (2007) reported that ERS were more costly and only marginally effective compared to advice.

Pavey identified three studies relating to ERS cost-effectiveness (Stevens *et al.*, 1998; Isaacs *et al.*, 2007; Gusi *et al.*, 2008), concluding that all studies in comparison to controls were cost effective, though this was taken from studies using sedentary, but healthy participants (with the exception of Gusi *et al.* (2008)). The authors concluded that the findings were limited by the lack of long-term effectiveness of ERS, therefore the estimates of cost effectiveness should be considered with

caution. Following this, Pavey *et al.* (2011a), latterly published as Anokye *et al.* (2011), utilised a decision analytical model to estimate cost effectiveness of ERS, using data derived from the previous research. The model was based upon a sedentary population aged 40-60 years, concluding that ERS are more expensive, but more effective than usual care. However, the findings suggested that cost effectiveness was highly sensitive to changes in effectiveness or ERS costs. Edwards *et al.* (2013), using the data from Murphy *et al.* (2012) calculated cost effectiveness, and concluded that the ERS was cost saving, if participants adhered to the scheme. Campbell *et al.* (2015) developed this work further by including data from Murphy *et al.* (2012), however came to similar conclusions, with cost effectiveness being very sensitive to the assumptions of ERS effectiveness.

2.3.4 Quantitative research summary

From a methodological and reporting viewpoint, ERS research is subject to significant heterogeneity. The schemes included within research, are highly variant in terms of their duration, setting, the opportunities offered for PA, and what, if any, behavioral support is provided. This variance limits the ability to compare schemes, and as such, the data collection and analysis, as well as the quality of reporting has been criticised, including an inability of the RCTs to establish causality (Oliver *et al.*, 2016). Rowley *et al.* (2020) highlight the limited exercise prescription details within the NICE guidelines, therefore this lack of guidance could partly explain the variance in ERS. Aside from the variability of the ERS themselves, the variable definition, measurement and reporting of key measures such as uptake and adherence, plus the predominantly subjective measurement of PA is problematic, making solid conclusions about ERS effectiveness difficult. Dugdill, Graham and McNair (2005) criticised the collection of unavailing data, or a lack of evaluation within operational ERS, and as a consequence, inferred that they have not improved. A lack of evaluation or collection of unavailing data, has led to a limited awareness of what works, and this limits the potential effectiveness of ERS (Dugdill, Graham and McNair, 2005).

In addition to insufficient or inadequate RCTs, a reliance on them to calculate overall effects as a method of evaluating ERS has been questioned (Littlecott *et al.*, 2014). However, this point will be discussed in the qualitative research section of this review, and more so within the methodology (chapter three), providing more detailed discussion.

Despite flaws within the research, some patterns have emerged. Exercise referral schemes are not maximally utilised, as they suffer from limited uptake and overall adherence. Females appear to have higher uptake, but lower adherence compared to men, while older participants are more likely to adhere. Participants with, or referred for mental health conditions appear to have limited adherence and benefits compared to other conditions. Beyond this, there is limited consistency, or understanding of personal or demographic patterns with uptake and adherence. Despite the limited uptake and adherence, there appears to be a small increase in PA levels, with adherent participants. Factors such as adherence and PA increases have an impact on measures relating to cost effectiveness or numbers needed to treat. Currently, ERS appear to be marginally cost effective, however this finding is highly sensitive to any changes in clinical effectiveness and adherence. Although the body of evidence has grown, the quality of the evidence has remained variable, with very limited understanding as to why ERS suffer from limited uptake and adherence, particularly within specific populations or subgroups, such as younger participants or females. Finally, there is very limited explanation as to why many of the outcomes reported within the quantitative studies occur. The following section discusses the qualitative research that has attempted to understand some of (and other) findings within ERS.

2.4 Qualitative ERS research

Quantitative research provides a vital contribution to outcome evaluation for ERS (Moore *et al.*, 2013), however quantitative methods are unable to take into account the cultural context within which schemes are implemented and function (Moore *et al.*, 2013). Without understanding the context within which complex interventions such as ERS are implemented, it is difficult to understand how an intervention may or may not work, and through understanding casual mechanisms, more effective interventions can be designed and implemented to the appropriate groups (MRC, 2008). The conclusions of key systematic reviews using quantitative research have highlighted that qualitative research should be a research priority going ahead (Pavey *et al.*, 2012; Campbell *et al.*, 2015). Despite this, in 2019, ERS research has predominantly been quantitative (Hanson *et al.*, 2019) and the lack of good quality research has been highlighted (Gidlow *et al.*, 2008). Although quantitative ERS research is more numerous, qualitative research, as a standalone study, or nested within a mixed methods approach has increased in prevalence, and will be investigated within this review.

The NICE (2014b) ERS guidelines, from a qualitative viewpoint, were informed by the review from Morgan *et al.* (2013), latterly published in the BMC Public Health Journal as Morgan *et al.* (2016). This systematic review (referred to as Morgan *et al.* (2016) forthwith) appears to be the first comprehensive review of the qualitative ERS research. The review included 33 UK relevant papers from 1995-2013, and focused upon the factors that influence referral to, attendance at, and successful adherence to ERS. The review included studies that provided the views of participants, ERS providers, and service commissioners. Twenty four of the included studies were qualitative, eight cross-sectional and one longitudinal. The quality of the studies were appraised using the NICE (2012) quality appraisal form, with three considered high quality, two of which were qualitative and one longitudinal. 20 were moderate quality, 14 of which were qualitative and 6 cross-sectional and finally, 10 were low quality studies, eight of which were qualitative and two cross-sectional. Seven additional papers were included in the review which were sibling papers, or publications from PhD theses.

Following Morgan *et al.* (2016), the only other systematic review searching specifically for qualitative ERS research is Eynon *et al.* (2019). This review aimed to investigate the psychosocial factors that underpin ERS adherence, and utilised research from quantitative and qualitative studies. This review contained five qualitative studies not included in Morgan *et al.* (2016) and used an adaptation of the National Institutes for Health (NIH) "Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies" to appraise the studies. In total, 10 studies were qualitative, with four mixed-methods studies. None of the qualitative studies were considered high quality, with nine moderate and five of low quality. Morgan *et al.* (2016) and Eynon *et al.* (2019) did not agree upon the quality of Sharma, Bulley and van Wijck (2012), apprising it as moderate and low quality respectively, however this was the only discrepancy. The studies included in Morgan *et al.* (2016) and Eynon *et al.* (2019) ranged from 8-26 weeks in duration, and were in the majority UK based studies. Table 2.3 provides an overview of the papers included within each review.

Table 2.3 Overview of papers included within Morgan et al. (2016) and Eynon et al. (2019)

Review	Included papers	
Morgan *et al.* (2016)	High quality	Carroll, Ali and Azam (2002); Wiles *et al.* (2008); Tai *et al.* (1999)
	Moderate	Beers (2006); Crone (2002); Graham (2006); Hardcastle (2002); Martin and Woolf-May (1999); Mills (2008); Murphy *et al.* (2010); Schmidt *et al.* (2008); Sharma, Bulley and van Wijck (2012); Shaw *et al.* (2012); Stathi, McKenna and Fox (2004); Taket, Crichton and Gauvin (2006); Wormald and Ingle (2004); Wormald *et al.* (2006); Clark (1996); Cummings (2010); Khanam and Costarelli (2008); Markland and Tobin (2010); Morton, Biddle and Beauchamp (2008); Rahman *et al.* (2011)
	Low	Cock (2006); Joyce *et al.* (2010); Lord and Green (1995); Myron, Street and Robotham (2009); Singh (1997); Taylor (1996); Walsh and Hurley (2012); Ward (2007); Beaufort-Research (2013); Day and Nettleton (2001)
	Sibling papers/PhD Thesis	Crone, Smith and Gough (2005); Mills *et al.* (2013); Moore *et al.* (2013); Gauvin and Taket (2007); Taylor, Doust and Webborn (1998); Wiles *et al.* (2007); Hardcastle and Taylor (2005); Hardcastle and Taylor (2001)
Eynon *et al.* (2019)	Moderate	Moore *et al.* (2013); Eynon, O'Donnell and Williams (2018); Graham (2006); Hardcastle and Taylor (2005); Hutchison, Johnston and Breckon (2013); McNair (2006); Mills *et al.* (2013); Stathi, McKenna and Fox (2004); Taket, Crichton and Gauvin (2006)
	Low	Bozack *et al.* (2014); Fenton *et al.* (2015); Hardcastle and Taylor (2001); Jones, Harris and Waller (1998); Sharma, Bulley and van Wijck (2012)

There are a range of qualitative studies that were not included within the two systematic reviews by Morgan *et al.* (2016) and Eynon *et al.* (2019). Pentecost and Taket (2011) investigated the views of ERS participants, including the views of non-attenders, low and high attenders respectively. This study, along with Lord and Green (1995) and Martin and Woolf-May (1999), appears to be the only that has specifically recruited non-adherent participants, albeit including participants with chronic conditions only, across a range of different ERS and a pulmonary rehabilitation service. Moore, Moore and Murphy (2011), Moore, Moore and Murphy (2012), Mills *et al.* (2013) and Din *et al.* (2015) considered the views of ERS exercise professionals, in relation to facilitating referrals, adherence or using motivational interviewing with participants. Beck *et al.* (2016) investigated the use of behaviour change techniques (BCTs) by ERS exercise professionals and most recently, Birtwistle *et al.* (2018) and Hanson *et al.* (2019) investigated the experiences of ERS participants, all of which were based within UK ERS. Beyond these studies, qualitative ERS research is limited.

The aims of the individual qualitative studies vary, and the focus of the two key systematic reviews that were predominantly informed by the same studies, were also different. Morgan *et al.* (2016) focused on using studies to inform what factors influenced referral, attendance and successful completion to ERS, plus long-term PA participation, whereas Eynon *et al.* (2019), assessed the psychosocial factors associated with ERS adherence. As stated, both reviews used in many instances, the same studies to support different research aims, indicating the difficulty of categorising the studies in a similar way to the quantitative research (i.e. PA outcomes, physiological outcomes etc.). Therefore, for the purpose of this literature review the qualitative ERS research will be summarised under the following headings: Understanding facilitators and adherence, Understanding barriers and dropout and Understanding staff viewpoints. A final section, including quantitative and qualitative studies, will relate specifically to behaviour change techniques used within ERS.

2.4.1 Understanding facilitators and adherence

Understanding why participants adhere, and what the facilitators to adherence are, has been considered in the majority of studies, although uptake has been the focus of one study (Birtwistle *et al.*, 2018). While the focus of this thesis is adherence, the literature relating to uptake is considered, as this provides insight into the views of participants. The views of participants that successfully attend ERS has been investigated far more widely, compared to those that dropout, possibly because it may be easier to recruit adherent participants. Although Morgan *et al.* (2016) and Eynon *et al.* (2019) employed different study aims, both considered adherence, and reported similar findings. Support from family, peers and providers was often reported as a facilitator towards ERS adherence. 17 studies within Morgan *et al.* (2016) and seven within Eynon *et al.* (2019), discussed the importance of ERS staff support in relation to adherence. When support was present, it was viewed as a facilitator, and when absent, viewed as a barrier to adherence. The specialist knowledge provided by staff, relating to the technical skills required to exercise competently were viewed as a requirement for adherence and also supported confidence to exercise safely while helping to maintain motivation to exercise. Staff support was viewed as facilitator and a motivation to uptake (Birtwistle *et al.*, 2018), and once within the scheme, motivation facilitated adherence (Morgan *et al.*, 2016; Hanson *et al.*, 2019). Pentecost and Taket (2011) reported that support from various sources, including family, friends and ERS staff was important and supported

adherence. Participants that received staff support, in terms of monitoring (i.e. how they used exercise equipment) or being provided information (to support the management of their condition through exercise and nutrition) appeared to have higher adherence. Additionally, participants receiving support from family or friends, as either practical support (i.e. getting to the exercise venue) or emotional support (i.e. encouragement) also had higher adherence.

Peer or social support was also viewed as a facilitator to adherence by Morgan *et al.* (2016), reporting this within nine studies as motivators, while peer support was beneficial in terms of increasing enjoyment or engagement within 15 studies. Enjoyment derived from attending, is also associated with facilitating adherence in its own right. Eynon *et al.* (2019) identified studies highlighting the enjoyment participants gained from attendance (Mills *et al.*, 2013; Stathi, McKenna and Fox, 2004), but also enjoyment from knowing they were in a secure environment supported by specialists (Sharma, Bulley and van Wijck, 2012), which links to the importance of staff support. Eynon *et al.* (2019) reported that group exercise provided social support within 9 studies, and provided more detail as to why engaging with peers was beneficial for participants. Idea exchange, a sense community, peer modelling, being part of a group as a shared experience, and gaining an incentive to attend (Bozack *et al.*, 2014; Fenton *et al.*, 2015; Mills *et al.*, 2013; Moore *et al.*, 2013; Graham, 2006; McNair, 2006) provided explanations for the positive perception of peer support. Uptake has been supported by peers (and family) (Birtwistle *et al.*, 2018), and the social interaction provided within the ERS by peers was viewed as a motivation to attend (Hanson *et al.*, 2019). Pentecost and Taket (2011) also highlighted that peer and social support was a facet of perceiving the benefits of attending (discussed later) and linked to increased adherence. It would appear that social support, from family or peers is an important facilitator of adherence to ERS, however there are examples where participants' social anxieties relating to other ERS users could be a barrier to attendance (Hanson *et al.*, 2019; Martin and Woolf-May, 1999), highlighting that peer support may not be universally appreciated by all participants.

A tailored or individualised approach within the ERS is favourably viewed by participants as a facilitator, particularly when linked to the needs and perceived abilities of participants, as identified within eight studies by Morgan *et al.* (2016). Of these eight studies, four were PhD theses, however the other four provided evidence supporting the importance of, and the participants appreciation of

individualisation. Martin and Woolf-May (1999) highlighted how adherent participants perceived their programme to suit their needs. Participants within Wormald and Ingle (2004) and Taket, Crichton and Gauvin (2006) studies also appreciated a personalised service, particularly when the staff were perceived to understand their individual situation. While Taket, Crichton and Gauvin (2006) identified these views within adherent participants, it is not clear which participants were adherent or non-adherent within the Wormald and Ingle (2004) study, and while personalisation was clearly appreciated, it is not clear if it impacted on adherence or not. Although not cited as a facilitator or barrier to adherence, within Moore *et al.* (2013), adherent participants recognised that tailoring was important, but difficult when trying to create an exercise class containing participants with a range of abilities. The Morgan *et al.* (2016) review also identified the need for religious as well as personal individualisation, as sensitivity and an ability to cater for the needs of religious requirements supported adherence within Muslim females (Carroll, Ali and Azam, 2002), and was a reason for refusal to participate if it was not (Schmidt *et al.*, 2008).

Morgan *et al.* (2016) suggested that increasing the variety of available activities could be a facilitator to adherence, as various studies that included the views of adherent participants (Moore *et al.*, 2013; Stathi, McKenna and Fox, 2004) and one which did not state whether the views were from adherent participants (Shaw *et al.*, 2012), requested more variety in the activities offered. Three PhD theses included within Morgan *et al.* (2016) made reference to participants' dislike of the gym due to boredom. Eynon *et al.* (2019) identified that choice and flexibility was linked to participants perceiving that a positive outcome could be achieved, and linked to adherence, however is based on one thesis (Mills, 2008).

Financial support, through subsidised exercise appears to support uptake (Birtwistle *et al.*, 2018) and adherence (Shepich, Slowiak and Keniston, 2007). However, Morgan *et al.* (2016) highlighted a range of studies (Schmidt *et al.*, 2008; Shaw *et al.*, 2012), plus three theses where the cost of attending was a barrier. This suggests that, while subsidies appear to be facilitators, for some participants even subsidised exercise is still perceived to be too costly (Hanson *et al.*, 2019). Subsidising costs is a potential facilitator but may not be a guarantee of adherence.

Adherent participants have reported being able to recognise the benefits of attendance. Within Morgan *et al.* (2016), where the majority of participants included

were adherent, highlighted a large range of studies where participants recognised the benefits of attending. The recognised benefits included physical health or fitness, weightloss, blood pressure improvements or PA increases, plus improvements in mental health across 14 separate studies. Although the published studies cited by Morgan (Stathi, McKenna and Fox, 2004; Wormald and Ingle, 2004; Taket, Crichton and Gauvin, 2006; Wormald *et al.*, 2006; Sharma, Bulley and van Wijck, 2012; Moore *et al.*, 2013) supporting these findings did state that participants recognised the benefits of attending, it is not clear if participants required the perceived achievement of these outcomes to continue adhering or not. However, the perceived benefits were not only physical/physiological such as weightloss or blood pressure improvements, but social and psychological, such as being able to get out of the house, and even the potential of being able to reduce pain or improve mood appeared to support adherence. Eynon *et al.* (2019) further supported this by identifying Eynon, O'Donnell and Williams (2018), which reported adherent participants clearly valuing and recognising the benefits of attending the scheme, not only in the short-term, but also to gain benefits in the future. Pentecost and Taket (2011) identified that adherent participants recognised the benefits of attendance and it meant more to them compared to low/non-attenders. Other studies have reported adherent participants being motivated by other factors such as increased autonomy or returning to work, or examples of participants maintaining attendance despite increasing weight (Moore *et al.*, 2013).

The concept of an "exercise identity" has been considered in relation to exercise adherence in various studies. Hardcastle and Taylor (2005), interviewing adherent female participants, appear to be the first to discuss this in relation to ERS. They consider that those with an exercise identity prioritise exercise, make exercise a habit, and plan exercise. Additionally, participants identified feelings of achievement, making further links between adherence and recognising the benefits of attendance. Pentecost and Taket (2011) also identified exercise identity as the way in which participants describe themselves in relation to exercise and how it influences their behaviour. However, the definition of exercise identity appeared to be wider and more encompassing. Exercise identities were linked to adherence where participant's identity included confidence in exercising, or maintaining a self-image of being "sporty" (in males) or associated with improving health (for women). Exercise identity could, however, also be a barrier for some participants, for example participants with low expectations of their physical ability had lower attendance, therefore is not always linked to increased adherence. Eynon, O'Donnell and

Williams (2018), however, did report exercise identity to be present within adherent participants, whereby participants perceive themselves to be “exercisers” and view exercise as part of their lives, making exercise part of their routine, while recognising long-term benefits of exercise when committing to exercise. Adherent participants also appear to be able to take responsibility for their exercise or recognise that they need to do so, and have the ability to exercise on their own. Hardcastle and Taylor (2005) highlighted how participants’ exercise identities are developed through autonomy and feelings of control, whereby participants could exercise on their own, and exercise for their own benefits. Autonomy has been recognised within adherent participants, Fenton *et al.* (2015) highlighted how choice and being provided with the tools to enact changes was recognised, while Eynon, O’Donnell and Williams (2018) highlighted that adherent participants have recognised the need to take control, and could do so by “claiming back” part of their lives.

Morgan *et al.* (2016) and Eynon *et al.* (2019) considered the impact of intrinsic and extrinsic motivation on adherence. While 17 individual studies were included within Morgan *et al.* (2016) relating to motivation, the authors reported that there were no clear themes, likely due to the heterogeneity of the papers, with the exception that in six of the studies, some participants lacked self-motivation. However, of the six papers cited to support this, four were PhD theses and of the other two (Taket, Crichton and Gauvin, 2006; Rahman *et al.*, 2011), only the former utilised a qualitative methodology and reported that participants with motivation adhered, with the opposite being true of non-adherent participants. Eynon *et al.* (2019) however reported a theme whereby motivation was viewed to support adherence, this was cited using a range of studies, the majority of which were graded as medium quality (Stathi, McKenna and Fox, 2004; Hardcastle and Taylor, 2005; Mills *et al.*, 2013; Moore *et al.*, 2013; Eynon, O’Donnell and Williams, 2018), with three studies highlighting extrinsic motivation at the beginning of the scheme and intrinsic at the end (Hardcastle and Taylor, 2005; Sharma, Bulley and van Wijck, 2012; Eynon, O’Donnell and Williams, 2018). Most recently, Hanson *et al.* (2019) identified that motivation towards improving, or maintaining health outcomes was present in adherent participants.

Through the literature relating to adherence, it appears that support is a key facilitator, and can originate from participants’ family, peers or the scheme providers. Tailoring and individualisation also appears to facilitate adherence and is appreciated by participants, as is financial support through subsidised attendance

fees. Adherent participants also appear to recognise the benefits of attending schemes, while adherent participants have been observed to develop “exercise identities”. Although intrinsic and extrinsic motivation has been cited in relation to adherence, a clear theme within the literature has not been established.

2.4.2 Understanding barriers and dropout

As previously stated, the views of adherent participants have far greater representation within the ERS literature than the views of non-adherent participants. Indeed, a paucity of knowledge and understanding about why participants do not adhere exists (Leijon *et al.*, 2011). However, some views of non-adherent participants have been gained, albeit in limited numbers, and in the main not as part of a purposeful sampling process. Most views of non-adherent participants have come as part of a convenience sampling approach, therefore has been subjected to limited focus. Morgan *et al.* (2016) provides the main insight into barriers to adherence, and included a limited number of studies investigating the views of non-adherent participants (Lord and Green, 1995; Martin and Woolf-May, 1999; Stathi, McKenna and Fox, 2004; Taket, Crichton and Gauvin, 2006; Sharma, Bulley and van Wijck, 2012). However, although the focus of the review was the barriers to adherence, very few of the studies included, had specifically recruited to understand the participants’ reasons for dropping out, with the exception of Martin and Woolf-May (1999) and Taket, Crichton and Gauvin (2006). Beyond these studies, only Pentecost and Taket (2011), Vinson and Parker (2012) and Hanson *et al.* (2019) have included the views of non-adherent participants, while Birtwistle *et al.* (2018) included the views of participants that did not uptake to an ERS. Pentecost and Taket (2011) and Hanson *et al.* (2019) included the views of adherent and non-adherent participants, and disclosed the adherence status of participants, but did not specifically aim to understand the specific reasons for dropout (Pentecost and Taket, 2011), or recruit on the basis of adherence status (Hanson *et al.*, 2019). Although Vinson and Parker (2012) included the views of non-adherent participants, the adherence status of the participants was not disclosed, and the reasons for dropping out were not considered.

As reported in the previous section relating to facilitators, Morgan *et al.* (2016) reported that support from ERS staff was viewed as a facilitator, and when absent, viewed as a barrier. While the absence of support appears to be a barrier, Vinson and Parker (2012) and Hanson *et al.* (2019) provide more depth to the impact of

ERS staff being barriers to adherence, not merely by being absent. Although Vinson and Parker (2012) did not stipulate which comments came from adherent or non-adherent participants, they highlight how a lack of confidence in the ability of the staff and a lack of interest shown by staff towards the participants was viewed negatively and was cited as a barrier to adherence. Hanson *et al.* (2019) also highlighted an example whereby a lack of staff support, or ability to contact staff had a negative impact on a non-adherent participants' experience. Martin and Woolf-May (1999) highlight how non-adherent participants would return to the gym if they received more empathy from staff, while Taket, Crichton and Gauvin (2006) highlight that three non-adherent participants stopped attending due to negative experiences with staff during the initial consultation. Beyond staff support, Hanson *et al.* (2019) reported how a of lack social integration as part of a scheme contributed to dropout for one participant.

The gym environment/setting has often been cited as relevant by adherent and non-adherent participants alike. Morgan *et al.* (2016) reported across 10 studies, that the gym setting made participants feel uncomfortable or intimidated, and that participants considered the gym environment as a barrier. This could be due to body image concerns of the participants themselves, or the perception of other gym users' bodies. Additionally, the gym equipment was reported as a barrier for some participants. However, five of the nine studies were PhD theses, and of these, only two included the views of non-adherent participants (Martin and Woolf-May, 1999; Wormald and Ingle, 2004), though it is not clear if Sharma, Bulley and van Wijck (2012) included non-adherent participants or not. Martin and Woolf-May (1999) were able to highlight that the gym environment was a reason for dropout, however in Wormald and Ingle (2004), it was not clear if the views put forward about the gym environment were from non-adherent participants or not, nor was it clear if the gym environment was a reason for dropout. Both studies highlighted that the gym equipment and its operation was an issue for participants, and this was the case for both adherent and non-adherent participants. Morgan *et al.* (2016) highlighted six studies where for some participants, the music, or TV content in the gym was problematic, however, this included only two published studies (Martin and Woolf-May, 1999; Khanam and Costarelli, 2008), with the former highlighting music as an issue, but not a reason for dropout, and the latter not stating the participants adherence status. The accessibility, location (and perceived safety at the location) and use of public transport to attend ERS were reported as barriers by Morgan *et al.* (2016). While the majority of the papers supporting these findings were published,

only four (Martin and Woolf-May, 1999; Carroll, Ali and Azam, 2002; Taket, Crichton and Gauvin, 2006; Shaw *et al.*, 2012) included the views of non-adherent participants and supported these findings. Beyond the studies included within Morgan *et al.* (2016), no other studies including the views of non-adherent participants have reported the gym environment as a barrier to adherence.

The ERS scheduling times have been reported as a barrier, often in relation to the impact attendance has on childcare or working. Morgan *et al.* (2016) reported that the timing of sessions was a barrier across ten studies, and of these studies, Lord and Green (1995), Martin and Woolf-May (1999), Taket, Crichton and Gauvin (2006), Morton, Biddle and Beauchamp (2008) and Shaw *et al.* (2012) all reported that a lack of time due to work or childcare time was a reason for non-adherence. Pentecost and Taket (2011) reported that making time to exercise when faced with family commitments created stress for participants, however, it was not clear if this decreased attendance or included the views of non-adherent participants. Most recently, Birtwistle *et al.* (2018) and Hanson *et al.* (2019) identified that work commitments, or a potential return to work, were viewed by participants as a barrier to uptake or part of the struggle to attend.

Participant concerns relating to health issues, developing pain or exacerbating a current condition/pain were cited as barriers within Morgan *et al.* (2016). The majority of papers were PhD theses, however Martin and Woolf-May (1999) and Taket, Crichton and Gauvin (2006) directly stated that pain was a reason for dropout, whereas Morton, Biddle and Beauchamp (2008) reported that health related barriers were a reason for dropout. Additionally, Lord and Green (1995) reported that illness and pain, were reasons for participant dropouts. Although this paper was included in the Morgan *et al.* (2016) review, it was not cited in relation to pain and reasons for dropout. The only other study reporting on pain is Hanson *et al.* (2019), whereby low back pain was described by a participant as making her feel unable to cope with the exercise, however, was not cited as the main reason for dropout.

A key gap within the ERS literature relates to the viewpoints and experiences of non-adherent participants. Recruiting non-adherent participants to understand their non-adherence does not appear to have been a primary focus in the studies that have included the views of non-adherent participants. Therefore, it is difficult to explain why participants do not adhere to schemes. The majority of findings are from PhD theses, or in terms of the barriers to adherence, based on the view of adherent

participants. While some views and experiences of non-adherent participants have been investigated, this has provided limited understanding towards the barriers to adherence, and less insight into why participants dropout. Additionally, there appears to be no attempt to explain why specific populations that are at risk of, or who account for most dropout (i.e. younger participants or females) do so.

2.4.3 Understanding staff viewpoints

The two systematic reviews of ERS qualitative research (Morgan *et al.*, 2016; Eynon *et al.*, 2019) did not include the views of ERS staff, however other investigation does exist. Although the views of health care professionals referring to ERS have been investigated (Graham, Dugdill and Cable, 2005; Taket, Crichton and Gauvin, 2006; Din *et al.*, 2015), the studies did not specifically consider their views on adherence, but on the barriers or facilitators relating to referral.

Wiles *et al.* (2008) appear to be one of the first studies to consider the views of ERS staff. While reporting a limited number of staff accounts, particularly in relation to adherence, it was recognised that the staff were happy to allow carers to come and support participants to access gym equipment, therefore potentially supporting adherence. This study, however, focused on the appropriateness and acceptability of a scheme taking stroke patients following discharge from Physiotherapy, and included the perspectives of participants, Physiotherapists and scheme staff. Moore, Moore and Murphy (2011) appear to be the first to focus on staff views in relation to ERS adherence, including the views of 38 staff in total. This study highlighted a range of themes relating to dropout and adherence. Dropout was explained by staff as failing to effectively identify participants that were appropriately motivated to attend and were aware of the benefits to be gained from the ERS. Additionally, staff indicated that participants with mental health issues were more likely to dropout, likely due to the anxiety related to being in a foreign exercise environment and to feeling self-conscious about exercising in public. Some staff identified a training need to support participants with mental health issues.

While discounted exercise was seen as a facilitator for some, mirroring the findings of Hanson *et al.* (2019), Moore, Moore and Murphy (2011) reported that although staff viewed the £1 cost as acceptable for the participants, the increase to £15 for gym membership following completion of the scheme, was viewed as prohibitive towards long term exercise.

In terms of adherence, the staff reported that participants who had sought a referral (as opposed to being referred) were more likely to adhere. Anxiety relating to limited confidence to exercise around other people, or within a different environment, was not exclusive to participants with mental health issues. Staff reported general participant anxieties at the start of the scheme regardless of referral type and sought to manage these anxieties by reassuring participants that the classes were for ERS participants only, and this supported familiarity with the staff.

Providing educational and motivational support was viewed as a facilitator to adherence, and additional provision of support for participants with mental health issues was seen by some staff as a way of supporting adherence. Modifying the exercise environment was viewed by staff as a facilitator to adherence, in particular by ensuring exclusive gym use for the ERS. However, this strategy was viewed with some concern, as staff felt that it did not help participants overcome anxieties about exercising after the scheme. Fostering social support between participants was seen by all staff as important to support adherence. Moore, Moore and Murphy (2012) followed the 2011 study to include the views of course coordinators on the use of motivational interviewing (MI). Motivational interviewing was seen by some as a potentially beneficial communication style. However, MI was not unanimously supported, and the links between it and supporting adherence were not clear (Moore, Moore and Murphy, 2012)

Mills *et al.* (2013) investigated the views of participants, exercise providers and referring health professionals, in relation to the perceptions of ERS success. Regarding adherence, this study provides little insight other than that exercise providers felt participants attended more for the social benefits, as opposed to the exercise benefits. ERS staff within Vinson and Parker (2012) recognised that inflexible attendance times were a potential barrier to attendance for participants. The staff recognised that staff visibility within the scheme was an adherence facilitator, and their absence a barrier. This matched the views of participants within the study, and that of previous studies discussed in this section. Providing motivation for participants that had little exercise experience was viewed as a facilitator (Vinson and Parker, 2012), as was attempting to increase the number of contacts made with participants in addition to the initial or final assessments. Finally, contacting and following up on participants that had dropped out, was reported to increase the return rate of participants.

While investigation into the views of ERS staff has been limited, there appears to be concordance between what participants and ERS staff consider as barriers or facilitators to adherence. Within the studies, staff were aware of potential barriers and took measures to attempt to address them for example, through increased support. While not always feasible, staff appear to attempt to increase the contact they have with participants, to support adherence, and recognise that it may not be possible to address some of the barriers such as flexible attendance times.

2.5 Understanding the use of Behaviour Change Interventions to improve adherence

NICE (2014b) recommend that to support participant adherence, schemes should incorporate behaviour change interventions, and referenced six specific behaviour change approaches (all of which are included within the NICE (2014a) guidelines for behaviour change).

The recommended behaviour change interventions for ERS are:

1) Recognising when people may or may not be more open to change.
2) Agreeing goals and developing action plans to help change behaviour.
3) Advising on and arranging social support.
4) Tailoring behaviour change techniques and interventions to individual need.
5) Monitoring progress and providing feedback.
6) Developing coping plans to prevent relapse.

NICE (2014a) consider a behaviour change intervention to involve a set of techniques used to change the behaviour of individuals, communities or populations. Whereas, a behaviour change technique (BCT), is a specific component of an intervention that is designed to change behaviour. Additionally, a BCT should use specified criteria, enabling it to be identified and delivered with the possibility of accurate replication.

As identified within this literature review, a limitation of the research, and the schemes, is a high level of variability in characteristics such as, but not limited to, duration, content and reasons for referral. This results in an inequity across schemes, towards what participants may expect in terms of experience, support and outcomes (Beck *et al.*, 2016). Despite NICE recommending the inclusion of BCTs, very limited evidence specific to ERS and BCTs exists, meaning there is a lack of clarity as to which techniques should be implemented within ERS (Beck *et al.*, 2016). Specific to adherence, very little research has investigated if the implementation of

a behaviour change intervention or technique has impacted on ERS adherence rates, or if components of behaviour change can predict adherence. Only Duda *et al.* (2014) appear to have implemented aspects of behaviour change within a scheme (in this instance an intervention based on self-determination theory (SDT)), as part of an RCT. The RCT compared a standard ERS with an ERS using an SDT intervention (staff in the SDT arm were also encouraged to use Motivational Interviewing). Although adherence was not recorded, 7-day physical activity recall was, and no difference between the standard and SDT ERS was reported, however both groups significantly increased reported PA.

The majority of other studies investigating behaviour change have considered if elements of behaviour change models (e.g. trans-theoretical model (TTM)) can account for differences between adherent and non-adherent participants. In the majority of these studies, no measures related to SDT or TTM at baseline assessment predicted adherence, or were significantly different between adherent and non-adherent participants (Jones *et al.*, 2005; Edmunds, Ntoumanis and Duda, 2007; Eynon, O'Donnell and Williams, 2017). However, Morton, Biddle and Beauchamp (2008) reported that self-determination levels were significantly higher in adherers. Rahman *et al.* (2011) reported a mixture of findings, where most aspects of SDT did not differ between adherent and non-adherent participants (motivational regulation, autonomy and relatedness satisfaction), with the exception of competence satisfaction being significantly higher, in adherers, and a change in intrinsic motivation predicting adherence. Isaacs *et al.* (2007) measured two components (stages of change and barriers to exercise scale) based on the TTM at baseline, however reported no difference between the included groups (ERS, walking group, and advice only) and made no reference to links between adherence and components of the TTM. Self-determination theory has been explicitly investigated within ERS by two other studies, where Markland and Tobin (2010) included former ERS participants and Rouse *et al.* (2011) included participants prior to embarking on an ERS. However, neither study aimed to consider the impact of SDT interventions on adherence. While other studies referenced within this literature review, such as Wormald *et al.* (2006) and Murphy *et al.* (2012), have reported what type or aspect of theory was included within the scheme, none have gone beyond describing the theory.

Although the impact of behaviour change interventions or techniques appears to be limited within the small number of studies included, it has been reported that this

may not be due to the interventions or techniques themselves. Moore, Moore and Murphy (2012) and Duda *et al.* (2014) have reported issues with implementation of the interventions. Each study reported issues with staff training for MI or SDT respectively. Moore, Moore and Murphy (2012) reported staff issues with the timing of the training provided, or did not appear to "buy into" the concept of MI, whereas Duda *et al.* (2014) highlighted that training days were limited, therefore reducing the rigour of SDT implementation. Investigating the content and delivery of ERS consultations, Beck *et al.* (2016) used the CALO-RE taxonomy developed by Michie *et al.* (2011) to understand what BCTs were delivered by staff, in addition to the behaviour change counselling index (BECCI) (Lane *et al.*, 2005), to assess the delivery style utilised by staff. The findings revealed that all staff used some BCTs, however, were not consistent in doing so for each consultation. Whereas, one member of staff only used some BCTs once within all 22 observed consultations. The counselling styles observed were also inconsistent. Beck *et al.* (2016) highlighted the variability of consultations even within a small number of observations, a common theme throughout ERS research (and the schemes themselves). However, a key difference between the staff in the Beck *et al.* (2016), and those within Moore, Moore and Murphy (2012) and Duda *et al.* (2014), was that they did not receive training for the implementation of BCTs. Therefore, it is not surprising that consultations are variable, especially in light of the limited evidence for, or in the guidance of using behaviour change interventions for ERS.

Campbell *et al.* (2015) concluded that current ERS did little to develop interventions based on BCTs. As a consequence, when considered as a treatment, ERS does not appear to be particularly effective (Hutchison and Johnston, 2013). However, due to the limited implementation and assessment of behaviour change interventions, it is difficult to make clear conclusions about their effectiveness in relation to adherence.

Hutchison and Johnston (2013) have suggested that the adoption of the biomedical model in the identification of ERS participants could possibly be a reason for limited success. An issue with applying the biomedical model regarding recruitment to ERS is that a "diagnosis" may not identify the underlying issue causing the problem; therefore the treatment may not effectively address the issue. Hutchison and Johnston (2013) explain that although sedentary behaviour is linked to, and can potentially cause physical health problems, and that PA can potentially improve the health problems, attempting to increase PA via ERS does not necessarily address

the cause of sedentary behaviour- because the causes of sedentary behaviour can be complex, multifaceted and individualistic. Lifestyle change (such as increasing PA) is a challenging process that requires support and determination (Murray *et al.*, 2012). The cause of a barrier to reducing sedentary behaviour, such as a lack of motivation, is unlikely to be generalisable (Hutchison and Johnston, 2013), to the point that simply removing the barrier could be considered as naïve (Murray *et al.*, 2012). This suggests that further understanding of the psychological mechanisms or barriers that maintain a sedentary lifestyle of ERS patients is required in order to facilitate PA increases via ERS. Murray *et al.* (2012) have suggested that increasing knowledge of barriers to PA, and developing a tailored pathway to address individual's needs, may be a method of developing lifestyle behaviour change.

2.6 Literature review summary

Exercise Referral Schemes have been commissioned and utilised across the UK. They vary in their duration, location, setting and with the support provided to participants. The research relating to ERS also mirrors their variation. The research has employed RCTs and non-RCTs of varying quality and rigour, all of which are subject to inconsistent outcome measures, a lack of agreement on measuring and defining adherence (and non-adherence) and accurate measurement of PA. Oliver *et al.* (2016) highlighted a lack of RCTs, which have not established causality and are variant in data collection, analysis and reporting. A recent systematic review of reviews (Shore *et al.*, 2019) reported that because of the inconsistent quality of studies, in particular poor reporting, and a lack of clear scheme-wide consensus, few conclusions can be made about ERS effectiveness.

However, there are some consistent findings within the research. Adherence is limited, particularly within younger participants and to a lesser extent with females. Although based upon highly variant reporting, it appears participants referred with, or for a mental health condition may uptake and adhere less compared to other referral conditions/reason. Beyond these demographics, there is little understanding about the personal and referral characteristics of adherent and non-adherent participants. The effectiveness of ERS has been questioned to support PA, and has inconsistent findings (Campbell *et al.*, 2015; Rowley *et al.*, 2018). From a qualitative viewpoint, there is limited research on the experiences of ERS participants collectively, why some interventions work, why certain groups appear more suited to ERS, and the experiences of issues within ERS interventions. Good quality

research is especially lacking (Gidlow *et al.*, 2008). There are no clear explanations as to why, for example, younger participants and females have limited adherence, and there is no research specifically focused upon sub-groups to understand why adherence is limited.

To develop the body of ERS evidence further, more research detailing who does not adhere, and more importantly, why they do not adhere is required. Understanding "the who and the why" will provide a stronger basis to improve ERS in the future, not only for the participants, but to help preserve the services themselves.

Chapter Three: Methodology

3.1 Chapter aim

This chapter will describe the overarching methodology for the thesis, and the methods within each of the three studies. Justification for the theoretical underpinning of the methodology, and of the individual studies will be provided; including how the three studies inform the thesis as a whole.

3.2 Thesis aim

This thesis aims to increase understanding regarding the types of participants that dropout of a local exercise referral scheme (ERS), understand why they dropout, and to use this information to develop a participant informed intervention to increase adherence. This overall aim will be achieved by completing the following:

- To investigate the adherence rate of a current ERS.
- To investigate what, if any, personal or referral characteristics are more likely to be associated with dropout or adherence.
- To investigate what, if any, personal or referral characteristics, including barriers to exercise predict dropout or adherence.
- Increase understanding of what the barriers and facilitators to ERS adherence are.
- To explore why the barriers and facilitators are present.
- To explore how to overcome/facilitate overcoming the barriers and enhance the facilitators.
- To design and implement an intervention, in the form of a pilot study to increase adherence.

The aims cover a wide, yet linked, spectrum of ERS concepts. In order to meet the aims, three distinct, but connected studies will be used, whereby each study informs the next.

3.3 Philosophical assumptions

This thesis will utilise a mixed methods approach, and this approach can involve philosophical assumptions (or paradigms), such as postpositivism, constructivism or pragmatism (Creswell, 2014), led in part by the researchers experience. These assumptions or paradigms influence how a researcher knows, interprets and values methodology within research (Doyle, Brady and Byrne, 2009).

A pragmatic assumption (termed as approach) will be utilised within this thesis, essentially linking the purpose of the thesis with the procedures utilised throughout the process (Morgan, 2013). A pragmatic approach to mixed methods research is to utilise the combination or mixture of methods that are most effective at answering the research question, and the primacy of the research question means that epistemological or ontological debates regarding quantitative or qualitative research are side-lined (Bryman, 2006; Johnson and Onwuegbuzie, 2004). A pragmatic approach is not informed exclusively by theory or data (Doyle, Brady and Byrne, 2009), but uses an abductive reasoning approach, converting observations into theories, and assesses the theories through action, moving between induction and deduction (Morgan, 2007). This orientates itself to solving “real world” problems by accepting that there are singular and multiple realities open for empirical inquiry (Feilzer, 2010).

A pragmatic approach can be focused to a problem centred and real-world practice orientated topic (Creswell, 2014). Pragmatism suits a topic such as ERS- there is a distinct problem (adherence) and is practice based within the real world. A pragmatic approach focuses on “what works” (from a research methods perspective, and is distinctive from “does it work” regarding analysis of ERS), with the research question and problem being the prime focus (Creswell *et al.*, 2011). Pragmatism within mixed methods acknowledges the differences, from an epistemological viewpoint, between qualitative and quantitative methods, but uses each for a shared aim (Bishop, 2015). The benefit, is the ability to provide a way of combining methods that provide the best chance of answering the research question (Johnson and Onwuegbuzie, 2004; Doyle, Brady and Byrne, 2009). Specifically to public health (i.e. ERS), Bishop (2015) highlighted Yardley and Bishop (2008) and Cornish and Gillespie (2009), that stated pragmatism within mixed methods does not ask what is reality, but whether the research has valuable external consequences, for example, the improvement of public health services. Johnson and Onwuegbuzie (2004) advocate the use of a pragmatic, or needs-based/contingency approach to research

method and concept selection within mixed methods research. As this thesis is aiming to improve part of a public health service, pragmatism appears to be appropriate, particularly with the use of a mixed methods approach. This thesis will be pragmatic, in the sense that all of the methods employed, with be utilised on the basis that they have been selected for their ability to support the fulfilment of the research questions.

3.4 Evaluating complex interventions

The range and number of research designs available to researchers has increased (Creswell, 2014). This has increased methodological diversity (Creswell *et al.*, 2011) and provided more options to tailor methodologies for specific research aims/questions. Identifying and utilising the appropriate method involves finding a match between the purposes of the research, and a method of meeting these purposes (Morgan, 2013). Therefore, this is an important stage of research planning, as the research question informs the methodological choice (Fetters, Curry and Creswell, 2013).

Within healthcare and public health, complex interventions are focused upon at risk populations (Craig *et al.*, 2013; Moore *et al.*, 2014). Complex interventions have been utilised to target smokers, those with dietary issues, and those with limited PA levels, all of which involve complex multifactorial aetiology (Hutchison and Johnston, 2013; Moore *et al.*, 2014). There appears to be no definitive definition of a complex, or indeed simple intervention, however, (Craig *et al.*, 2013) suggested that complex interventions contain several interacting components. Complex interventions often attempt to address multiple causes, at multiple levels, with multiple components that may affect multiple outcomes (Moore *et al.*, 2014; Craig *et al.*, 2008). Craig *et al.* (2013) stated that researchers assessing complex interventions should also consider additional complexities aside from the main interacting components. The complexities may include an interaction between the control and experimental conditions, difficulties delivering or receiving interventions, outcome variability, and changeable levels of flexibility/variability of the interventions delivered.

Applying the characteristics of complex interventions as described by Craig *et al.* (2013) and Moore *et al.* (2014), in relation to ERS, it is plausible to consider ERS as a complex intervention. Edwards *et al.* (2013) highlighted multiple components involved within ERS, including fidelity to specific exercise interventions, uptake, adherence and mechanisms of behaviour change. Moore *et al.* (2013) and Moore

et al. (2014) highlighted how interventions are delivered (and the difficulty of delivering them, particularly if they are delivered within systems that are unpredictable) can add to the interventions' complexity.

Understanding how and where complexity lies, represents only one issue regarding ERS, as the evaluation of complex interventions is problematic (Craig *et al.*, 2008). The "gold standard" research, considered acceptable for ERS, is either an RCT, or a systematic review, which avoids including non-RCT research (Gidlow *et al.*, 2008). The aim of an RCT is to assess the effectiveness of an intervention, i.e. does it work in a specific condition or case (Bowling, 2014), when randomisation is feasible (Moore *et al.*, 2015). The exclusive use of RCTs has been subject to criticism, not only in the assessment of complex interventions (Mustafa, 2017), but also within the assessment of public health interventions (Victora, Habicht and Bryce, 2004) and ERS effectiveness (Crone and James, 2016). RCTs have been criticised for providing limited information about why an intervention may or may not work, especially if applied across various contexts, circumstances or for different purposes (Pawson *et al.*, 2005). Their ability to address complexity or context sensitivity within real world problems is also questionable (Kerry, 2017). The effect sizes calculated from RCTs cannot provide insight into how an intervention may be replicated, or the results reproduced within specific contexts (Moore *et al.*, 2015). Specific to ERS, Gidlow *et al.* (2008) criticised RCTs for their strict and narrow inclusion criteria, leaving a small number of "acceptable" studies to base guidelines of practice upon. Although strict inclusion criteria supports the internal validity of RCTs, this reduces external validity (Mustafa, 2017), therefore questioning the ability to apply the findings to practice (Gidlow *et al.*, 2008), especially across the many heterogeneous ERS within the UK. A response to this, has been the use of pragmatic trials such as Murphy *et al.* (2012) and Littlecott *et al.* (2014), however these are subject to concomitant reduction in internal validity (Godwin *et al.*, 2003).

The use of RCTs to assess complex interventions is problematic as heterogeneity and a lack of intervention standardisation (a common issue in ERS) results in a departure from the gold standard of a RCT model (Mustafa, 2017). The issue of heterogeneity within ERS for the purposes of evaluation and analysis has been discussed by Pavey *et al.* (2011a), whereby the pooling of data from RCTs was not possible due to the heterogeneity of the populations, interventions, and comparators reported within the ERS literature. The impact of narrow inclusion criteria is also present in assessment of other metrics such as cost effectiveness. Campbell *et al.*

(2013) highlighted that the modelling to calculate cost effectiveness may be over simplistic, because conditions such as type two diabetes, coronary heart disease and stroke have been considered as mutually exclusive, and in addition, only represent a very small number of conditions which can lead to ERS referral.

However, this is not to suggest that RCTs have no place, but highlight the limitations of evaluating a complex intervention, such as an ERS, using an RCT exclusively. The use of a single methodology is often inadequate to meet the challenge of implementing (or assessing) complex interventions, treatments or innovative practices (Palinkas *et al.*, 2015). Asking "does it work" (and answering using quantitative methods exclusively) may be an inappropriate question to ask of ERS (Moore *et al.*, 2013; Moore *et al.*, 2014), as it is unable to answer nuanced aspects of ERS, or understand their complexity due to their complex behavioural and social influences (Oliver *et al.*, 2016).

Employing a standalone RCT method for this thesis would, therefore, appear to be unwise, in light of the aforementioned issues. Gidlow *et al.* (2008) discussed the undervalued role of qualitative research to understand ERS. Moving beyond quantitative data profiling, using alternative approaches such as qualitative research, will help explain, rather than describe, findings (Pavey *et al.*, 2012 cited by Moore et al., 2013). The use of alternative research approaches is seen as essential to develop the ERS evidence base (Crone and James, 2016) and has increased over time, with a recent review (Morgan *et al.*, 2016) including 24 qualitative studies alone.

Using good quality qualitative research has the potential to facilitate the process of improving ERS (Gidlow *et al.*, 2008) as the qualitative input of service users (participants/scheme providers) provides the ability to understand contextual influences and implementation issues, as well as predict feasibility (Evans, Scourfield and Murphy, 2015).

Employing qualitative research provides a link to the MRC guidelines (discussed later), to understand the contextual issues, identify a theory and develop an intervention informed using qualitative data. To develop a comprehensive ERS evidence base, it has been suggested that the effectiveness of schemes should include qualitative measures (Gidlow *et al.*, 2008) as PA behaviour is often erratic and complex. This limits how appropriate a dose-response model of analysis is (Dugdill, Stratton and Watson, 2009), and there have been no qualitative studies

that have attempted to use theory to drive research (Eynon, O'Donnell and Williams, 2018).

Qualitative ERS research has been subject to criticism, due to the limited number of studies, of limited quality, which have limited diversity and a narrow focus only on the experiences of a scheme, or the views of older, or female participants (Gidlow *et al.*, 2008; Moore *et al.*, 2013). There is minimal research attempting to improve ERS, possibly because many schemes are not evaluated (Dugdill, Graham and McNair, 2005), therefore limiting the ability to make improvements.

It is noteworthy to highlight the debate regarding what constitutes "good quality" qualitative research (Mays and Pope, 2000). What Gidlow *et al.* (2008) consider as good/poor quality ERS research is not clear. However, they suggest that research needs to be in-depth enough to understand the referral process, the participant journey, and how this can be influenced by exercise professionals. Gidlow *et al.* (2008) are not alone criticising the depth of qualitative research, as depth along with a lack of transparency has been highlighted (Ward *et al.*, 2013). Williams *et al.* (2007) provided detailed criticism, highlighting the superficial nature of the questioning and analyses employed, a lack of depth when investigating the experiences of participants, and what could be done to improve the experience of participants. Although, not directly citing ERS evidence, Dixon-Woods *et al.* (2004) identify a lack of explanation of what, or how, an analytical approach was used as common problems within qualitative research. This thesis aims to address these issues highlighted within the ERS research and avoid such pitfalls.

This section has highlighted the issues of utilising standalone methods to assess complex interventions. In response to the limitations of using RCTs to evaluate complex interventions, the Medical Research Council (MRC) published a framework for the design and evaluation of complex interventions (Campbell *et al.*, 2000), which was later updated in 2008 (Craig *et al.*, 2008; MRC, 2008). The framework provides alternatives to the use of RCTs and encourages a pragmatic approach to the use of RCTs and observational methods, including both quantitative and qualitative approaches (Craig and Petticrew, 2013). Evaluating complex interventions requires an understanding of the range of effects, how they vary amongst participants and the causes of the variations (MRC, 2008). Understanding how an intervention may work, provides the possibility to design more effective interventions (MRC, 2008). The original MRC guidelines (Campbell *et al.*, 2000) recommended sequential development phases of an intervention, including feasibility testing, with a final RCT

based upon an estimation of effect size, ready for wider implementation. The original framework was criticised due to its linearity and limited attention to the context within which interventions take place (Craig *et al.*, 2008). The updated guidelines attempted to improve by increasing the emphasis on evaluation to build theory, reducing the models' linearity, while increasing the importance of development and implementation phases, and the importance of context (Craig *et al.*, 2008).

The Medical Research Council guidelines (MRC, 2008) for developing and evaluating complex interventions will support the methodology within this thesis. The systematic reviews by Campbell *et al.* (2015) and Morgan *et al.* (2016), plus the literature review have supported identification of the existing evidence, whereas a final intervention will be developed from quantitative and qualitative research within the thesis, and assessed within a pilot trial. Gidlow *et al.* (2008) have suggested that the future research needs of ERS should focus on "why interventions work or don't work and why some groups are more suited than others". This thesis, supported by the MRC guidelines, will aim to address these areas using a mixed methods approach, as this approach has been cited as appropriate to explore "the what and how, or the what and why" (Tashakkori and Creswell, 2007a). Details of the mixed methods will be discussed in the following section.

3.5 Mixed methods

The use and integration of both quantitative and qualitative data is an approach termed "mixed methods", which can involve, or be driven by philosophical assumptions (Creswell, 2014). The use of mixed methods research has proliferated within healthcare research since the early 2000s (O'Cathain, Murphy and Nicholl, 2007; Doyle, Brady and Byrne, 2009), is now a prevailing paradigm, and a legitimate alternative to using qualitative and quantitative mutually exclusively (Doyle, Brady and Byrne, 2009). Mixed methods research has gathered increased acceptance (Plano Clark, 2010), is utilised across various health related topics (Creswell *et al.*, 2011) and provides an opportunity to enrich the understanding of complex interventions, and the nuances of barriers and facilitators within an intervention (Green *et al.*, 2015). Mixed methods designs are considered preferable, as they provide greater understanding of issues within the research, compared to the use of one methodology alone (Wisdom *et al.*, 2012; Palinkas *et al.*, 2015).

As mixed methods is emerging, there are varying definitions (Doyle, Brady and Byrne, 2009). Creswell *et al.* (2011) defined mixed methods research as an

approach that focuses on research questions requiring real-life contextual understanding, multiple perspectives and cultural influences. Tashakkori and Creswell (2007b) defined mixed methods as a process of collecting and analysing data, where the findings are integrated, and inferences within a single study or inquiry are drawn through quantitative and qualitative research. This allows for both measurement and understanding of a topic, through the use of multiple perspectives of a phenomenon (Ritchie and Ormston, 2014) and to answer separate questions about the same topic (Ritchie and Ormston, 2014). Mixed methods assesses magnitude and frequency of constructs with quantitative research, while utilising qualitative research to explore the meaning and understanding of the constructs (Creswell *et al.*, 2011). This therefore uses multiple methods to integrate the strengths of each, to frame an investigation within a philosophical and theoretical position (Creswell *et al.*, 2011).

This potentially provides a more complete understanding of a research problem other than using either qualitative or quantitative methods in isolation (Creswell, 2014), by addressing the weaknesses of each method, including a lack of generalisability in qualitative methods and the lack of depth in quantitative methods (Green *et al.*, 2015). Mixed methods takes advantage of qualitative methods, focusing on context and the experiences of people, providing the possibility to understand processes and settings (Creswell *et al.*, 2011). In conjunction, quantitative methods provide the tools to test hypotheses, examine relationships between variables, therefore providing the possibility of replication and generalisation of a study to a larger population (Creswell *et al.*, 2011).

To improve healthcare research, it should be designed, disseminated and implemented with stakeholder input (Green *et al.*, 2015). This can include policy makers, agency directors, clinical staff, patients and their families (Green *et al.*, 2015). The use of mixed methods within healthcare allows for input by patients to highlight experiences and perspectives to improve research (Green *et al.*, 2015), and also supports exploration of counterintuitive findings (MRC, 2008). There has been a recent call, and acceptance, to use mixed methods within research including the domains of mental health (Palinkas *et al.*, 2011), quality of life research (Klassen *et al.*, 2012) and ERS (Campbell *et al.*, 2015).

Finally, it is important that the data generated within mixed methods should be integrated (O'Cathain, Murphy and Nicholl, 2010) and is discussed later in this chapter. A clear link between the quantitative and qualitative findings should exist,

and not result in two sets of data that are largely independent (Bryman, 2007), and should intentionally use both to answer a specific question by combining the strengths of each (Creswell *et al.*, 2011). This thesis will utilise a mixed methods approach, in order to take advantage of the benefits afforded by integrating quantitative and qualitative methods, and gain multiple insights into the ERS.

3.6 ERS and mixed methods

Teddlie and Tashakkori (2003) suggested that with mixed methods, qualitative data provides depth and understanding of the success (or failure) of an intervention, whereas quantitative data can assess the predictors of success (or failure), and test working hypotheses. This concept of utilising mixed methods can be applied to the statement of Campbell *et al.* (2015), who advocated the use of a mixed methods approach within ERS. Campbell *et al.* (2015) suggested qualitatively investigating older participants or those with CHD conditions, as quantitative data analysis has indicated that they are more likely to have successful outcomes following an ERS referral. By doing so, Campbell *et al.* (2015) suggested that it may be possible to explore what elements of ERS are successful for those specific participants. Although this thesis will not aim to specifically focus on older/CHD participants, it aims to use a mixed methods approach focusing upon specific groups of ERS participants, who have been identified using quantitative data analysis, for investigation using qualitative approaches.

Mixed methods research has, albeit in limited number, been utilised within ERS. Mills *et al.* (2013) and Moore *et al.* (2013), have reported integrated findings relating to the concept of success in ERS, and the implications of delivering motivational interviewing within ERS. Oliver *et al.* (2016) suggested that mixed methods can highlight which groups may be poorly served by the ERS but can also provide detail about how barriers to exercise are individually experienced. This is an area that is poorly understood within ERS and is a key aim of the thesis to explore.

3.7 Data integration and overarching mixed method design

Mixed methods research involves the integration of quantitative and qualitative data. Data integration occurs in a variety of ways, at different times, levels of design and levels of interpretation (Fetters, Curry and Creswell, 2013; Green *et al.*, 2015), depending on the emphasis an individual study places on each type of data (Creswell and Plano Clark, 2011; Green *et al.*, 2015). This section provides an

overview of the main designs, methods and interpretation/reporting approaches considered to integrate data within the thesis, then concludes with an illustration and explanation of the final design employed. Table 3.1, taken from Fetters, Curry and Creswell (2013), provides an overview of the levels integration and approaches within each level that were considered for the thesis.

Table 3.1 Mixed methods levels of integration. Taken from Fetters et al., (2013)

Integration level	Approaches
Design- basic	Exploratory Sequential
	Explanatory Sequential
	Simultaneous
Design- advanced	Multistage
	Intervention
	Case study
	Participatory
Methods	Connecting
	Building
	Merging
	Embedding
Interpretation and Reporting	Narrative (Weaving. Contiguous, staged)
	Data transformation
	Joint display

At the basic design level, data integration can broadly be defined as sequential or simultaneous (Fetters, Curry and Creswell, 2013). Sequential collection/integration methods can help explain the findings of the initial data collection, or inform what is analysed in the second section of data collection (Green *et al.*, 2015). Either qualitative or quantitative data can be collected first. Sequential integration is termed as exploratory or explanatory, depending on type of data collected initially. Qualitative data collected first, to inform a subsequent quantitative data collection, is exploratory, whereas quantitative followed by qualitative is termed explanatory (Fetters, Curry and Creswell, 2013; Green *et al.*, 2015). A simultaneous design concurrently collects and analyses data, suited for assessing trends over time or lags in effects (Green *et al.*, 2015). A sequential approach is more suitable for this

thesis, the benefit of which is to explain one phase using another (Ivankova, Creswell and Stick, 2006), as opposed to as trends over time or effect lags.

Advanced frameworks, consisting of four approaches (multistage, intervention, case study and participatory) are an addition to the three basic levels of design (Fetters, Curry and Creswell (2013). Multistage contains a combination of the basic design levels, including a minimum of three stages of sequential, or two stages including a convergent component. This approach suits longitudinal studies, focusing on design, implementation or intervention assessment. An intervention approach typically uses qualitative data, to develop, understand and explain quantitative findings within an intervention. A case study approach combines qualitative and quantitative data from a single case to understand it. Finally, a participatory approach includes the input of the population involved within the study, and combines the basic level of designs. Multistage frameworks are suitable for longitudinal studies evaluating and assessing a programme or intervention (Fetters, Curry and Creswell, 2013), therefore suggesting that this is suitable for the purposes of this thesis. It is noteworthy to highlight that Fetters, Curry and Creswell (2013) described the existence of an "Intervention mixed methods framework", however this method would not suit the requirements of this thesis as it does not utilise quantitative data as well as qualitative data to inform the intervention.

Fetters, Curry and Creswell (2013) described levels of method integration. This provides parameters for integration at the methods level, linking data collection and analysis. Linking occurs in four possible ways (connecting, building, merging and embedding). Connecting refers to one data base linking to another through a sampling frame. Building is similar, however, the findings from one database inform the collection approach for the subsequent database. Bringing two databases together for analysis and comparison is termed as merging, and if this process, or any of the other (connecting and building) occurs at multiple points, it is termed as embedding. This thesis will use a building approach, allowing each study to inform the subsequent one, using data beyond a sampling frame alone.

The final level of integration is interpretation and reporting of data, with three possible approaches: data transformation, joint display and narrative (Fetters, Curry and Creswell, 2013). Data transformation, involves the transformation of one data type into the other, then integrated and interpreted as one dataset. The joint display approach involves the integration of both qualitative and quantitative data within the

same visual medium (i.e. graphs/matrices), aiming to draw out new insights that would not have necessarily been observed if data were presented as separate entities. Data transformation and joint display are not suitable for this thesis, as transforming data does not support the thesis aims, while presenting the data from each study jointly would limit the insight gained from each study individually.

Narrative interpretation includes three subcategories- weaving, contiguous and staged, but is defined broadly as being composed of either a single, or a series of reports describing the qualitative and quantitative findings. Weaving is the thematic or concept driven report including quantitative and qualitative data together. Contiguous contains quantitative and qualitative within a single report, dividing the findings into separate sections. The staged approach provides reports at each stage of the study, and data are analysed (and published) separately at each stage. The interpretation and reporting of the thesis will be through a contiguous narrative approach, manifested as one thesis, with each chapter relating to either quantitative or qualitative data, as this will provide a clearer representation of the findings from each study and the building approach between each.

An important concept regarding data integration and analysis, is the analysis of consistencies and inconsistences of the study's findings (Green *et al.*, 2015). This is termed as the "fit" of data integration (Fetters, Curry and Creswell, 2013), and relates to the coherence of the qualitative and quantitative findings. Datasets can confirm findings, where each dataset supports the other. Data can expand findings, this being divergent findings that expand insight into a theme or support a central theme, or they can provide discordance. Discordance is the contradiction of findings between datasets and should be explained within the report, for example by considering areas of potential bias, or further investigated with additional data collection (Fetters, Curry and Creswell, 2013). This thesis will therefore consider how the data "fits" between each study.

This thesis will employ a mixed method explanatory design, where quantitative data will be collected and qualitative data used to explain the findings (Ivankova, Creswell and Stick, 2006; Creswell *et al.*, 2011; Green *et al.*, 2015). A third study, consisting of an intervention will be designed, and underpinned by the findings of the previous quantitative and qualitative studies. Using the taxonomy of Fetters, Curry and Creswell (2013), this is described as multistage mixed methods, as three or more stages are sequentially utilised.

Therefore, in summary, using the descriptions and taxonomy of Ivankova, Creswell and Stick (2006); Creswell *et al.* (2011); and Green *et al.* (2015), this thesis will employ a multistaged explanatory sequential mixed methods design, utilising a building approach and reported using a contiguous narrative.

Creswell and Plano Clark (2007) provided guidance on how a sequential design can be conceptualised, however, do not illustrate how a multistaged sequential design is conceptualised. An adaptation of this guidance (Figure 3.1) illustrates how this thesis is designed.

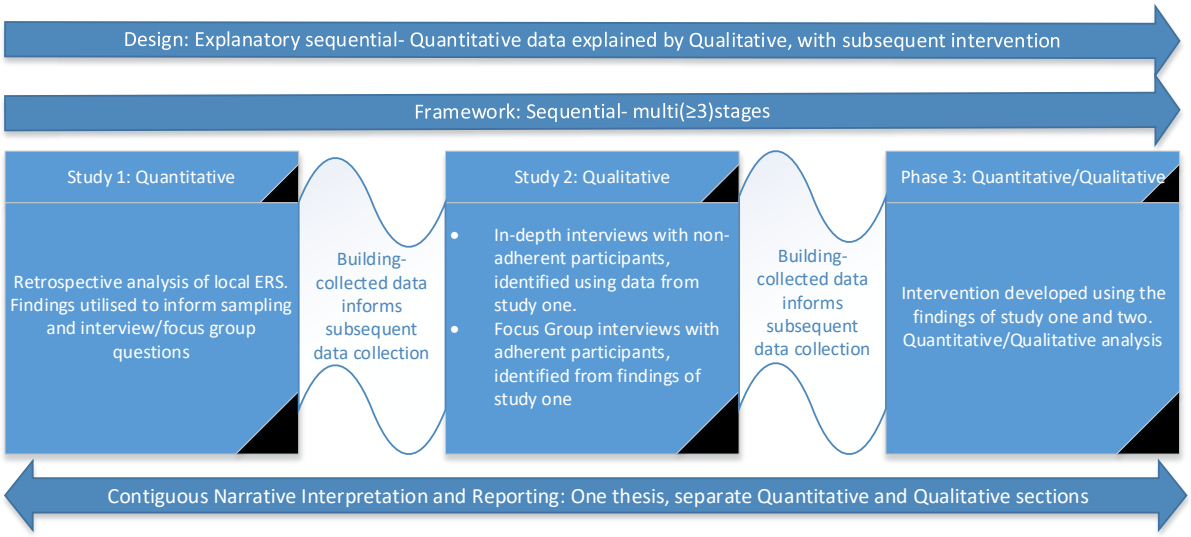


Figure 3.1 Illustration of how the sequential mixed methods data collection by Creswell & Plano Clark (2007) p122 In "Designing and conducting mixed methods research" is adapted using the integration principles and practices of mixed methods by Fetters et al., (2013) within this thesis.

The aims of this thesis are in part informed by the NICE (2014b) guidelines for ERS. Due to the limited research on the predictors of adherence/dropout, or analysis of barriers to adherence, the guidelines recommended future research should focus upon factors encouraging uptake and adherence, and identify any barriers preventing participation. All of these recommendations will be addressed within this thesis. Ultimately, this thesis utilises a pragmatic research approach, informed by the MRC (2008) guidelines to investigate the adherence levels of an ERS, identify what (if any) personal or referral characteristics or barriers to exercise predict dropout, understand why participants dropout or adhere, then develop an intervention based upon these findings, to improve adherence, with a mixed methods research design.

The use of mixed methods within this thesis provides three main benefits. Firstly, the quantitative component will provide an understanding of the adherence/dropout characteristics of the ERS. Secondly, the qualitative component will provide insight into the barriers to adherence and reasons for dropout within the context of the

scheme. Thirdly, qualitative insight into the experiences of participants successfully completing the scheme will provide a more holistic understanding of the ERS, and consider what barriers participants overcame and how. This information will be used to inform an intervention, in terms of its composition, format and method of implementation within a final study, and will be assessed using quantitative and qualitative measures.

Each study of the thesis informs the subsequent study and develops the intervention. The following sections discuss in more detail the methods and justification of the methods employed in each study.

3.8 Study one (Chapter four): Retrospective cohort study of the South Tyneside Exercise Referral scheme 2009-2014: Predictors of dropout and barriers to adherence

The first study will provide a quantitative starting point and base of the thesis. This study will provide an analysis of the ERS, using the raw data collected by the scheme over the course of five years. Gaining insight into the number and type of participants being referred, adhering and completing the scheme, will begin to provide context into who attends and is successful at completing the scheme. Additionally, understanding who the scheme is not successful for, will provide a guide as to how and where the subsequent studies will be focused within the thesis.

This study will utilise a retrospective analysis. Retrospective analyses are utilised to assess data that have been collected for purposes other than a specific study (Mann, 2003). The routinely collected data within the ERS, includes demographic, medical, physiological and self-reported outcomes. This quantitative data provides a logical starting point, supporting the overarching methodological design of the thesis. Retrospective analyses are able to assess multiple outcomes, are financially less burdensome compared to prospective studies, and use data that have already been collected (Mann, 2003). A retrospective analysis is desirable in this thesis as it provides a large dataset, which is available for statistical analysis. The range and depth of data, if collected with enough rigor and accuracy, can potentially provide insight into the “the who, the what and the when”, regarding ERS adherence/dropout. Investigating the patterns of dropout provides the ability to target specific populations of the ERS to explore (in the second study) and understand “the why”, and in doing so, fits with the pragmatic nature of this thesis.

Analysing previously collected data will potentially develop a working relationship with the manager and staff of the ERS, without using significant time or resources of the staff. Developing a working relationship during this study will help provide insight into the workings of the ERS for the author, and provide the foundation and links to recruit participants from the scheme for studies two and three.

Retrospective analyses contain drawbacks. As the data are not intended for analysis, the rigour of the data collection may be compromised (Mann, 2003) as missing or erroneous data are commonly cited issues (Fisher *et al.*, 2013). Additionally, retrospective analyses are susceptible to selection bias, therefore establishing causal relationships between variables is difficult (Ward and Brier, 1999). The findings of retrospective analysis should therefore be interpreted with caution. Despite this, the use of retrospective analysis provides a logical starting point for the thesis.

Once the data are obtained from the ERS, these will be formatted and standardised into one working document. The data will be screened for missing or erroneous entries and prepared for statistical analysis. The statistical analysis carried out will be dependent on the type and quality of the data provided in relation to the key aims/questions that are proposed to be investigated within this study. The key aims are related to 1) investigating adherence within the scheme, 2) investigate what, if any, personal or referral characteristics are associated with dropout/adherence and 3) investigate what, if any personal or referral characteristics predict dropout/adherence. To address these aims, it is anticipated that Chi-Squared analysis (χ^2), t-tests and Logistic regression will be required to analyse the data.

These analyses will provide the foundation and rationale to recruit specific groups of participants within the second study, in order to explore the reasons for adherence/dropout.

3.9 Study two (Chapter five): Qualitative analysis of barriers to adherence and facilitators of adherence

Study two will attempt to explain the findings from study one, and will do so by interviewing participants identified using the data from that study. The aim is to understand what the barriers and facilitators of adherence are, what the reasons for dropout are, and how to improve the scheme and adherence. This study will attempt to not only understand “the why” by explaining the findings from study one, but also

consider what the final (3rd) study may form in terms of an intervention. Study two will provide a clear and important building block between studies one and three.

Study two will utilise qualitative methods and will employ two separate forms of qualitative research, namely, in-depth semi-structured interviews and a focus group. The participants sampled for each, will be based upon personal, referral or dropout/adherence characteristics identified within study one. The interviews will recruit dropouts, whereas the focus group will recruit participants that successfully completed the scheme. However, the personal and referral characteristics of each will not be decided until the completion of study one.

Qualitative research provides the opportunity to explore phenomena, particularly if little is known about the topic or community in question (Green and Thorogood, 2018). Qualitative research can be a logical successor to quantitative data collection, in order to understand the meaning of the data, or data records that are commonly produced within public health (Green and Thorogood, 2018). The following sections discuss the methods and rationale of using in-depth interviews and focus groups, the sampling methods, and methods of data analysis used within study two.

3.9.1 In-depth semi-structured interviews

The first part of study two will utilise in-depth individual semi-structured interviews. In-depth semi-structured individual interviews are one of the most frequently used forms of data collection in qualitative research (Legard, Keegan and Ward, 2003), and are, in effect, a directed conversation towards the researchers' data needs (Green and Thorogood, 2018).

Structured and semi/unstructured interviews are typically differentiated in general, by the production of quantitative data in structured interviews (DiCicco-Bloom and Crabtree, 2006). However, the distinction between unstructured and semi-structured is less clear, as no interview can be entirely unstructured (DiCicco-Bloom and Crabtree, 2006). A difference is that observation and field notes, followed by interviews of the key informants, is undertaken with unstructured interviews, often in ethnographic research (DiCicco-Bloom and Crabtree, 2006). Semi-structured interviews however, often compose the only source of qualitative data within a specific study (Adams *et al.*, 2002 cited by; DiCicco‐Bloom and Crabtree, 2006).

Semi-structured interviews have an agenda set by the researcher, set around a pre-determined group of open ended questions. This allows additional questions to be

asked based upon the dialogue between interviewer and interviewee, and the responses determine the type of information produced within them (DiCicco‐Bloom and Crabtree, 2006; Green and Thorogood, 2018). Semi-structured interviews provide an ability to gain deeper insight into social/personal matters, and the co-creation of meaning with participants through the re-creation, reconstruction, interpretation and understanding of experiences or events (DiCicco‐Bloom and Crabtree, 2006; Green *et al.*, 2015). Semi-structured interviews are exploratory and flexible in nature, through participant interaction which shapes the interview, but retains standardisation and structure (that is not present in unstructured interviews). This ensures that the key topics regarding a given idea, programme or situation, are covered, and allows for comparison of a shared experience within a relatively homogenous group of participants (Boyce and Neale, 2006; DiCicco‐Bloom and Crabtree, 2006; Ritchie *et al.*, 2014b; Green *et al.*, 2015). This study of the thesis will use semi-structured interviews, as it is not testing an a-priori hypothesis which is more suited to highly structured interviews (DiCicco-Bloom and Crabtree, 2006). To provide a level of standardisation between each interview, semi-structured interviews are utilised in this study as opposed to unstructured interviews. A level of standardisation provides opportunities to build cumulative knowledge (Rodgers and Elliott, 2015), therefore supporting a topic with limited knowledge at present.

In-depth interviews have traditionally been conducted face-to-face (Ritchie *et al.*, 2014b) although they can also be undertaken via telephone calls or online. Face-to-face interviews have an increased likelihood of self-generated answers with open expression, include more completion talk, are generally longer than telephone interviews, and require less clarification (Irvine, Drew and Sainsbury, 2013). Therefore, where possible face-to-face interviews will be conducted, as they may be more suitable for topics that can contain emotional sensitivity, and provide the interviewer opportunity to anticipate or observe non-verbal or visual cues of interviewee distress (Sturges and Hanrahan, 2004), while telephone interviews may hinder development of rapport (Shuy, 2003). Whilst face-to-face interviews are preferred, telephone interviews will be considered if required. Telephone interviews facilitate participant contact and have demonstrated high levels of compliance (Fenig *et al.*, 1993), which may support recruitment, as participants within this study have a history of non-attendance. Additionally, telephone interviews have been supported to collect information on sensitive topics (Mealer and Jones, 2014), are perceived to offer increased privacy (Cachia and Millward, 2011), an ability for the

researcher to make notes without distracting the interviewee (Sturges and Hanrahan, 2004), while providing logistical conveniences (Cachia and Millward, 2011).

How the interview is framed will affect the type of data collected (Green *et al.*, 2015), and the decision of how the interview will be framed depends on how the data will be integrated. Green *et al.* (2015) suggested that questions leading to generalisations are more suited to facilitate the understanding of quantitative analysis, whereas questions gaining detailed responses may be more beneficial for the implementation of an intervention. This thesis encompasses both of these aims, as there is a need to understand quantitative data gained in study one, while supporting the development of an intervention in study three. Therefore, the interviews will utilise an approach that provides an opportunity to gain detailed responses, with scope for generalisation within the participants' answers in the context of the ERS. On balance of the points discussed within this section, in-depth semi-structured individual interviews will be used to investigate why a specific group of individuals are less likely to complete the ERS, a topic that has limited research and is poorly understood.

3.9.2 Focus groups

The second part of study two will utilise a focus group interview. Focus groups are group interviews (Sim, 1998; Kevern and Webb, 2001), differentiated from individual interviews by the participant interaction (Bradbury-Jones, Sambrook and Irvine, 2009). Focus groups are collective conversations, or group interactions, between participants that have had common experiences/exposures (i.e. experience/exposure of a health service), with the aim of understanding the participants' views, beliefs and attitudes regarding a particular topic (Finch, Lewis and Turley, 2014; Green *et al.*, 2015).

The underpinning rationale for the use of focus groups is based on the assumption that the stimulation and interaction a group discussion brings, will uncover information that an individual interview may not elicit (Kamberelis and Dimitriadis, 2005). Participants are able to provide their own view, listen to others' views, while being afforded the opportunity for reflection (Finch, Lewis and Turley, 2014). Hopefully, this develops further discussion and questions, resulting in a sharper and refined discussion, that provides deeper insight into a particular topic (Finch, Lewis and Turley, 2014).

Focus group use has increased within healthcare research (Wilkinson, 1998). A systematic review by Farrance, Tsofliou and Clark (2016) included various examples of focus groups in community exercise schemes, while they have also been part of a mixed method design for exercise schemes (Wallace *et al.*, 2014). Aside from the possibility of eliciting a wider/deeper range of ideas and perspectives, focus groups are more cost and time effective. As focus groups involve multiple participants at once, more views can be gained in a smaller timeframe than individual interviews (Green *et al.*, 2015). However, focus groups are not without drawbacks as they are more difficult to coordinate and conduct (Green *et al.*, 2015). Additionally, they may be less suitable for sensitive or highly complex topics as participants may not be willing to share sensitive information, while a focus group may not be able to explore a complex topic in as much depth as an individual interview (Green *et al.*, 2015).

A focus group will be used in this study due to the type of participants to be recruited and the information sought. The participants recruited for the focus group will have all successfully completed the ERS, and all had to a degree, a shared experience. This provides homogeneity within the group, and may facilitate disclosure as the participants can recognise their shared experience (Finch, Lewis and Turley, 2014). Heterogeneity within the group is desirable, as this can aid discussion (Finch, Lewis and Turley, 2014), therefore no restrictions on who is recruited will be applied, aside from ERS completion. This will allow for a range of age, gender and reasons for referral to the ERS, to be included within the focus group discussion.

3.9.3 Sampling

Purposive sampling will be used, in order to understand two specific ERS populations. Purposive sampling deliberately selects participants based upon characteristics or features, or because they have experience of the main concept being explored, and is, therefore, criterion based (Carter and Henderson, 2005; Creswell and Plano Clark, 2007). Criterion based sampling helps ensure participants are suitable to provide detailed exploration and understanding of the central themes or specific research question within a study (Ritchie *et al.*, 2014a). It does, however, provide the possibility of including diversity within a specific sample, therefore allowing exploration of the impact of variance within specific selection criteria (i.e. age) (Ritchie *et al.*, 2014a). Maximum variation will be utilised, whereby participants are selected to cover the widest possible range within a particular characteristic/criterion, the aim of which is to highlight diverse and unique findings,

or identifying common patterns within the given characteristic/criteria (Tilling, Peters and Sterne, 2005; Palinkas *et al.*, 2015). Maximum variation sampling can support representativeness/diversity within a selected group of participants (Palinkas *et al.*, 2015), therefore where possible, variation for age and gender will be applied. An element of convenience sampling will be utilised to support sufficient recruitment, whereby more readily accessible participants are recruited (Palinkas *et al.*, 2015). In the first instance, maximum variation sampling will be utilised. However, if insufficient participants are recruited, due to maximum variation being too restrictive, it will be discontinued and not applied. Further details are found in chapter 5.

3.9.4 Data analysis

The qualitative data from the interviews and focus groups generated within this study will be analysed using framework analysis. Framework analysis is a form of thematic analysis, also known as qualitative content analysis (Gale *et al.*, 2013). First developed in the late 1980s for social research, this has since been utilised within health (Gale *et al.*, 2013), applied policy and social research (Ram *et al.*, 2008). The use of framework method has increased within healthcare and across various research topics. Examples include the integration of research and practice within public health (Redwood *et al.*, 2016), understanding the experiences of hormonal replacement within breast cancer patients (Cahir *et al.*, 2015), gaining insight into adherers of ERS (Eynon, O'Donnell and Williams, 2018) and as part of mixed methods research to promote PA (Sebire *et al.*, 2016). This illustrates the breadth of application within contemporary, and at times, complex research.

Thematic analysis is useful for answering questions regarding specific groups or respondents (Green *et al.*, 2015). Thematic analysis helps organise data, as it is data driven, using codes directly formed from the data to develop themes and describe data in rich detail (Braun and Clarke, 2006; Attard and Coulson, 2012). Thematic analysis is not tied to a specific discipline or construct (Spencer *et al.*, 2014), therefore provides theoretical freedom and flexibility, while providing rich, detailed and complex accounts of data (Braun and Clarke, 2006).

The key difference between thematic analysis and framework analysis is the production of a data matrix, composed of cases and codes, that provide a structure (or framework) to analyse data (Gale *et al.*, 2013). This method provides a stepwise process of analysis, and data outputs that are structured, most commonly utilised within semi-structured interviews (Gale *et al.*, 2013). Framework method is a

systematic approach that aids in the identification of commonalities and differences within qualitative data, develops themes, concepts and categories that emerge from the data (Ritchie and Lewis, 2003), and facilitates the drawing out of descriptive or explanatory conclusions (Gale *et al.*, 2013). Framework method provides clear steps to follow in analysis, and provides summarised data in a highly structured manner (Gale et al., 2013). It can be considered a straightforward and transparent (Ward *et al.*, 2013) method of analysis. Data can easily be retrieved, and the charting aspect allows the analysis to be paused and returned to at later times, all of which supports transparency (Dixon-Woods, 2011; Swallow *et al.*, 2011; Ward *et al.*, 2013). Framework analysis allows themes or concepts to be identified for analysis *a-priori* (Srivastava and Thomson, 2009; Dixon-Woods, 2011), but also allows themes to emerge *de novo*. This enables questions or concepts to be considered in the analysis, but also allows the detection and analysis of issues that emerge from the data (Dixon-Woods, 2011). Framework also provides the benefit of multiple coding, with independent verification of analysis (Meyrick, 2006), refinement of codes (Barbour, 2001) and provides peer scrutiny to improve trustworthiness (Shenton, 2004).

As this study of the thesis does not have *a priori* question or hypothesis to test, but does have a broad research topic, the framework method is ideally suited as it does not require alignment with a specific theoretical approach. Therefore, this method is suitable for this thesis, as ERS, and in particular the research aims posed within the thesis, require a systematic approach that can be utilised within a complex topic area and has been shown as an effective method of qualitative data analysis.

Throughout the literature, the process of framework analysis has slight discrepancies in the descriptions used for each stage of analysis. Various authors have described between 5 to 7 steps involved within analysis. Ritchie, Spencer and O'Connor (2003) describe 5 steps (Identifying initial themes/concepts, labelling/tagging data, sorting by theme/concept, summarizing/synthesising the data), Spencer *et al.* (2014) describe 5 steps (familiarisation, constructing initial framework, indexing & sorting, reviewing data extracts and data summary & display) whereas Gale *et al.* (2013) describe 7 steps (transcription, familiarisation, coding, developing a working analytical framework, applying the analytical framework, charting into framework matrix and interpreting the data). Although different numbers of steps have been described, overlap between each steps exists. For example, Gale *et al.* (2013) and Spencer *et al.* (2014) described familiarisation as a

step, whereas Ritchie, Spencer and O'Connor (2003) included familiarisation within identifying initial themes or concepts. This inconsistency may appear to be in contrast to the purported benefits of framework analysis, namely the iterative and clear methodological analytic process. However, this inconsistency serves to highlight that each stage of analysis is not a mutually exclusive process (Gale *et al.*, 2013) and the distinction between data management and making sense of the data is not clear cut (Spencer *et al.*, 2014). For the purposes of clarity and transparency, the steps described by Gale *et al.* (2013) will be used within this thesis, due to the focus on healthcare research, as opposed to healthcare policy as per Ritchie and Lewis (2003). NVivo (Version 11, QSR International) Qualitative Data Analysis software package will be used to facilitate the analysis. The findings from this study will begin to provide insight into "the why" and used to inform the 3rd and final study.

3.10 Study three (Chapter seven): Development and implementation of an educational pamphlet and application to practice-a mixed methods pilot trial.

The findings from study two, will inform the intervention developed and used within this study. The findings will impact on the type of intervention, its form, content and style. As the intervention cannot be developed until after study two, the approach to develop the intervention is detailed in chapter seven. However, the method of how the intervention will be analysed is discussed within this chapter.

Analysis of the intervention is a vital aspect of the research process and the MRC (2008) provided guidance relating to how interventions should be evaluated. Complex interventions should be evaluated in terms of how they are delivered, and how acceptable the intervention is to the participants (Craig *et al.*, 2013). It is important to understand how the intervention is implemented, and how it functions in practice (Moore *et al.*, 2015). Evaluation of implementation and functioning within context, provides the opportunity to design more effective interventions to be used across various groups and settings (Craig *et al.*, 2008; Moore *et al.*, 2013). Interventions within ERS, or to support PA have often been poorly described (Hubbard *et al.*, 2018) and may have not been effective due to inconsistent delivery or limited engagement (Moore *et al.*, 2013). Research within the field of PA is growing, and developing effective interventions requires pilot trials which are able to address any uncertainties in preparation for future definitive trials (Horne *et al.*, 2018).

As discussed within this chapter, employing one isolated method of analysis (i.e. Quantitative methods or an isolated RCT) is limited. Therefore, a mixed methods pilot trial will be utilised to assess the intervention. The assessment will be analysed in two parts, the first a quasi-experimental pilot trial, with two parallel groups, one an intervention group, the other being the control group. The second part will consist of a focus group, including the participants from the intervention group, to gain qualitative feedback on the interventions acceptability. The conduct and reporting of the study will be guided by the Consolidated Standards of Reporting Trials (CONSORT) statement relating to pilot and feasibility trials published by Eldridge *et al.* (2016a). The outcomes used to assess the success of the pilot study will be detailed in chapter seven. A pilot study will be used following their recommendation to develop RCTs for complex interventions (Craig *et al.*, 2008), in order to avoid the resource heavy and participant burdensome poorly designed RCTs (Horne *et al.*, 2018). Due to the drawbacks of poorly designed RCTs, there has been an emphasis on carrying out preliminary investigations (Whitehead, Sully and Campbell, 2014). However, there is confusion about the how to "label" and to describe this preliminary work (Arain *et al.*, 2010; Whitehead, Sully and Campbell, 2014), which has led to inconsistent use of the terms pilot study and feasibility study (O'Cathain *et al.*, 2015; Eldridge *et al.*, 2016b). This impacts upon the definition, purpose, conduct and reporting of preliminary work (Horne *et al.*, 2018). For clarity and consistency of reporting within this study, the definition of feasibility and pilot studies as published by Eldridge *et al.* (2016b) will be adopted. Eldridge *et al.* (2016b) concluded that the term feasibility is an overarching concept that considers whether something will work, can it be done, how, and should the work proceed. A pilot study is a study where part or the whole of a future study is conducted on a smaller scale, to consider whether it will work or not. Eldridge *et al.* (2016b) stated that all pilot studies can be considered as feasibility, but not all feasibility studies can be considered as pilots (e.g. assessing the acceptability of an outcome measure). As the outcome measures for this study were not assessed, this study is termed as a pilot trial forthwith in this thesis. Including qualitative research following development of an intervention is advocated to consider if the intervention needs to be refined to improve acceptability to the users, and understand the value the users place upon the intervention (O'Cathain *et al.*, 2015). This pilot will include a qualitative component, therefore taking advantage of the benefits offered by mixed methods, by measuring and understanding the impact of the intervention through the use of multiple perspectives of a phenomenon (Ritchie and Ormston, 2014).

Chapter Four: A retrospective cohort study of the South Tyneside Exercise Referral Scheme 2009-2014: predictors of dropout and barriers to adherence

4.1 Background

Exercise Referral Schemes (ERS) have been reported to have limited adherence rates, ranging from 43-53% (Murphy *et al.*, 2012; Pavey *et al.*, 2012; Tobi *et al.*, 2012; Hanson *et al.*, 2013). Most research has been limited to investigating the relationship between adherence, gender and age (Pavey *et al.*, 2012), with the exception of a few studies which included factors such as socioeconomic status or ethnicity (Tobi *et al.*, 2012; Hanson *et al.*, 2013). There is limited evidence investigating what the predictors of adherence or dropout, or barriers to adherence, are. Therefore, NICE (2014b) recommended that research should focus upon factors that encourage uptake, adherence, and identify barriers preventing participation.

4.2 Aims

The aim of this chapter was to retrospectively analyse the data of an ERS, with particular focus upon participant dropout, the effect of various referral characteristics on dropout, and the predictors of dropout, including self-reported barriers to exercise. This chapter will provide the basis and grounding for the subsequent phases of the thesis. The aims of this chapter are:

- To investigate the adherence rate of the South Tyneside ERS.
- To investigate what, if any, personal or referral characteristics are more likely to be associated with dropout or adherence to the South Tyneside ERS.
- To investigate what, if any, personal or referral characteristics, including barriers to exercise, predict dropout or adherence in the South Tyneside ERS.
- Increase understanding of what the barriers and facilitators to adherence are in the South Tyneside ERS.

4.3 Method

4.3.1 Data procurement

Permission to use secondary data from the ERS was provided by the ERS manager. Ethics was submitted and approved on 18th February 2015 (HLSMK170215-Retrospective analysis of Exercise Referral Scheme (ERS) uptake and adherence-Appendix 1) which permitted the procurement and analysis of secondary data from the ERS, following anonymisation. The secondary data had been collected between April 2009 and April 2014, and recorded by staff using Microsoft Excel. Following anonymisation, the data were provided using a USB stick, containing 15 separate Excel files. Additionally, information regarding abbreviations and descriptions of the data was provided by the ERS staff to aid interpretation.

4.3.2 The Exercise Referral Scheme

The South Tyneside ERS, in the North East of England, was delivered in partnership with South Tyneside National Health Service (NHS) Trust, Primary Care Trust (PCT) and South Tyneside Council.

The ERS aimed to support the management or prevention of lifestyle related diseases to become an alternative to medical treatment alone. The ERS aimed to achieve this by providing safe PA opportunities, nutritional education and advice. Participants residing and registered with a General Practitioner (GP) in South Tyneside were eligible for referral, which could be initiated by a GP, or Healthcare professional, if the referrer considered the participant was willing to attend the scheme and benefit from a personalised PA programme, including educational advice and/or dietetic support.

The ERS was part of a wider weight management programme delivered as part of a five “Tiered” model within the NHS/PCT. Participants were categorised (see Figure 4.1) using the National Quality Framework for ERS (DOH, 2001), accepting participants from Tiers 2 and 3 only. Tier 2 participants have low-moderate comorbidities and a BMI >28kg/m^2, whereas Tier 3 participants have moderate-high comorbidities without BMI restriction. The inclusion and exclusion criteria for referral are presented in Table 4.1

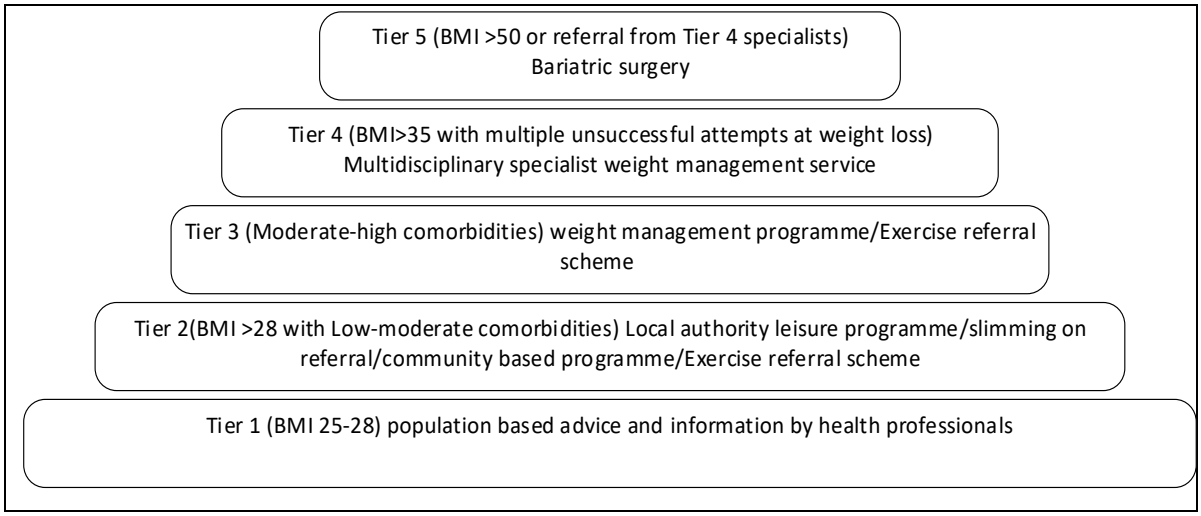


Figure 4.1 Description and definition of five tiered model utilised within the ERS

Table 4.1 Inclusion and Exclusion criteria of the ERS.

ERS Inclusion criteria	ERS Exclusion criteria
Adults 16 +. BMI 28 ≥ with or without a stable co-morbidity. Those with a BMI28≥ with one or more of the following co-morbidities: Osteoporosis. Arthritis or joint problems. Anxiety, depression or stress. Asthma, bronchitis/Emphysema/COPD. Angina/Post MI/CABG/PCI/Completed phase III. Mild to moderate heart failure. Suffered from or are recovering from a stroke. Claudication Balance problems as a result of Parkinson's disease, Multiple sclerosis etc. Awaiting or recovering from surgery (not cardiac). Non acute severe mental illness Family history of heart diseases Cholesterol levels consistently over 5 total cholesterol Hypertension (< 100 diastolic) All types of stable diabetes Hyperlipidaemia Inflammatory bowel disease Food intolerance or allergies Renal/liver problems Other dietary problems i.e. Coeliac disease Hyperglycaemia-HbAIC level ≤10 at least 15 months	People with BMI≤ 28 with no co-morbidities People who have previously been referred to the scheme People who are already exercising on a regular basis Less than 16 years old People who are not motivated and demonstrate no desire to make lifestyle changes People whose mental health or ability to learn would not allow them to participate in the programme Those showing symptoms or traits considered absolute contraindications to exercise: -Unstable angina -Unstable to acute heart failure -Specific cardiac problems Active myocarditis -Exercise induced ventricular arrhythmias -Hypertrophic obstructive cardiomyopathy -Significant aortic stenosis -Resting blood pressures above the recommended levels (cardiac patients 180/100, general population and patients diagnosed with hypertension 180/110) -Uncontrolled tachycardia, a resting heart rate ≥100bpm (≥120bpm for COPD) Unstable diabetes Any unstable condition Severe COPD with FEVI <40% with functional limitations disproportionate to the severity of the disease.

The ERS initiated a consultation between the participant and an exercise professional, aiming to identify the participants' readiness to change, individual goals and assess the participants' health status. Measurements of body mass index (BMI), heart rate, blood pressure and waist/hip width were recorded. Participants

self-reported their smoking status (Cigarettes/day), alcohol intake (Units/week), PA levels (Number of times physically active for ≥ 30mins/week), perceived health status, eating habits, amount of fruit and veg consumed each day and disability status. Additionally, participants indicated what barriers may prevent them increasing PA levels (participants select from a list of nine possible barriers including: lack of time, cost, lack of motivation, lack of confidence, lack of support, child-care, transport, illness/disability, don't enjoy). This information was re-recorded at half-way (week 6) and at the conclusion of the ERS (week 12).

Following the consultation, participants obtained a tailored exercise programme, and could also be signposted to additional support, such as smoking cessation. The programmes offered varied in terms of exercises and session frequency, depending on the participants' individual needs. Sessions typically were gym-based, however, pool-based sessions were available for participants that could benefit from non-impact exercise. Following the consultation, participants were free to access the leisure facilitates located across the South Tyneside council region.

All ERS staff were members of the Register of Exercise Professionals, holding at least a Level 3 gym instructor qualification/exercise referral qualification, accreditation in fitness testing/assessment and a valid first aid certificate. Sessions for high-risk participants were delivered exclusively by staff with the British Association of Cardiac Rehabilitation qualification, and trained to use an automated external defibrillator.

At half-way (6 weeks), participants attended a follow-up consultation, to assess progress and discuss how future exercise may be maintained. Participants attended a final consultation at scheme completion (at week 12), to re-record (for pre-post measures) data, which were sent back to the original referrer. All participants completing the scheme were offered a 24-week membership, entitling continued exercise at a subsidised rate, with some participants offered a specialist one-to-one weight management referral.

If participants did not attend, ERS staff attempted to make contact to ascertain if the participant intended to continue. If no contact was gained within two weeks, the participant was considered to have left, and the original referrer was notified.

4.3.3 Data extraction/management

The raw data were provided within 15 separate Excel spreadsheets compiled by different ERS staff members over the previous 5 years, with each file varying in levels of consistency. The files provided by the ERS, were labelled by the ERS as "new referrals non-engagement" or 'client information". The "new referrals non-engagement" included information about participants that had been referred to the ERS but had not made any contact with the ERS, and had not responded to follow-up by the ERS.

The "client information" files included data on participants that made contact with the scheme, following referral. The data within the "new referrals non-engagement" files contained limited information on the participants, including the date of referral, gender, age and referral tier. However, this data was inconsistently recorded, with many entries missing information. Due to the limited consistency of the data which even if present, would not provide insight into adherence or dropout, it was decided to exclude this data from the study.

Data within the "client information" files included data collected during consultations, in addition to data on the type of referral, referral reason, referrer, referral base/source and if the referral originated from primary or secondary care.

Data on gender, age and referral date were consistently recorded, however, a number of characteristics and outcome measures were not, and is a common issue with routinely collected data, resulting in missing or erroneous entries (Tobi *et al.*, 2012; Fisher *et al.*, 2013).

To manage and assess the data, a standardised spreadsheet was produced to compile data from all 15 files, allowing the data to be filtered. Filtering facilitated data checking, where spelling errors were corrected and cases of data describing the same outcome, but using different terms (i.e. "improved" or "got better") were identified. This allowed for standardisation of the descriptions (i.e. all terms changed to "improved") to increase the consistency of terminology and decrease the number of unnecessary variables.

Finally, all data were error checked. Any measures with missing data were coded as "not stated", in order to remove any ambiguity regarding that data cell, with clearly incorrect entries (e.g. resting heart rate of 4bpm) also coded as "not stated". Ages of 100 years and above were coded as "not stated", as the ERS used this code to

denote missing data. For potentially incorrect data entries that were at the extremes of normal ranges (i.e. bodyweight of 187kg), data were cross-referenced with other data entries for the same participant, and coded as “not stated” if they did not match.

Once the data management process was completed, it was possible to evaluate which variables were suitable for statistical analysis. During the last part of data filtering, a decision to exclude height, hip/waist, blood pressure, resting heart rate, ethnicity and fruit & vegetable intake was taken. However, data for age, gender, referral source, referral reason, referral type, referral tier, alcohol consumption, smoking status, PA, self-reported barriers to exercise and disability status were included for analysis. These data were included for two key reasons. Firstly, they were consistently recorded by the ERS, and secondly, they provided an overview of demographic, referral and the health choices of the participants which could be used to inform future referrals. In contrast, the excluded data were inconsistently recorded, and more importantly, were deemed to provide limited insight into how they may inform decisions to refer into the ERS. For example, analysis of height or hip/waist, would not provide insight into the referral. Analysis of ethnicity would have been valuable, however less than 2% of the data included information from participants that did not identify as Caucasian, limiting the value of analysing these data.

Following this process, 6894 participants were available for analysis. Ninety-eight of these participants did not start the scheme. Due to the limited number of these non-starters, compared to participants that did start, and the limited benefit of analysing these, they were removed from analysis. Following their removal, 6796 participants were available for categorisation/grouping and subsequent analysis, with the following variables: age; gender; referral source; referral reason; referral type; referral tier; alcohol consumption; smoking status; PA; self-reported barriers to exercise and disability status.

The next stage of data management involved grouping data from each variable into categorical levels appropriate for statistical analysis. This process was carried out for referral reason, alcohol consumption, smoking and BMI. Evidence to support categorisation is limited and heterogeneous. Where possible, all categorical grouping was applied using scales that have been previously used in publications or utilised by health organisations. Referral reasons were divided into “musculoskeletal”, “mental health”, “cardiovascular/pulmonary/metabolic” and “other”. The decision to keep mental health and cardiovascular diseases separate was based upon research (Murphy *et al.*, 2012; Pavey *et al.*, 2012; Hanson *et al.*,

2013) which separated mental health and cardiovascular disease, whilst the use of musculoskeletal and "other" categories captured the makeup of referral reasons within the data that were not otherwise categorised. Alcohol consumption was categorised using the scale utilised by Holmes *et al.* (2014), Smoking levels according to ASH (2015) and BMI using the WHO (2016) international classification. The category each condition was attributed to is found in Appendix 2.

Finally, each participant needed to be assigned into an attendance category. The terms of "uptake" and "adherence" are used throughout ERS research. However, the definitions are not consistently used or agreed upon. The principle papers relating to uptake and adherence used to inform the NICE (2014b) guidelines define adherence differently. Pavey *et al.* (2011a) define adherence as a participant attending at least 75% of the programme, whereas Campbell *et al.* (2015) consider "continued participation in the scheme" as adherence. Data were collected at initial assessment, 6 and 12 weeks only, making it impossible to calculate if 75% of the scheme had been attended, therefore the Pavey *et al.* (2011a) definition could not be applied. The Campbell *et al.* (2015) definition was adopted, as it was possible to identify participants' "continued participation within the scheme" through attendance at the week 12 final assessment. Table 4.2 provides an overview of the definitions used within this study.

Table 4.2 Attendance terminology and definition

Term	**Definition**
Starter	Participant present at first assessment
Adherence	Continued participation within the scheme (participant present at 6 and 12 week assessments)
Dropout	Participant not present at assessment (week 6 or week 12)

Inclusion and Exclusion of data recorded as "not stated" and data collapsing

As previously stated, record keeping and data collection was not consistent within the raw dataset. This resulted in categories possessing varying numbers of cases coded as "not stated". For example, the referral source category contained 63 cases of "not stated", whereas the referral type contained 3251 cases. Prior to analysis, a decision was required, whether to include the "not stated" cases, and in which

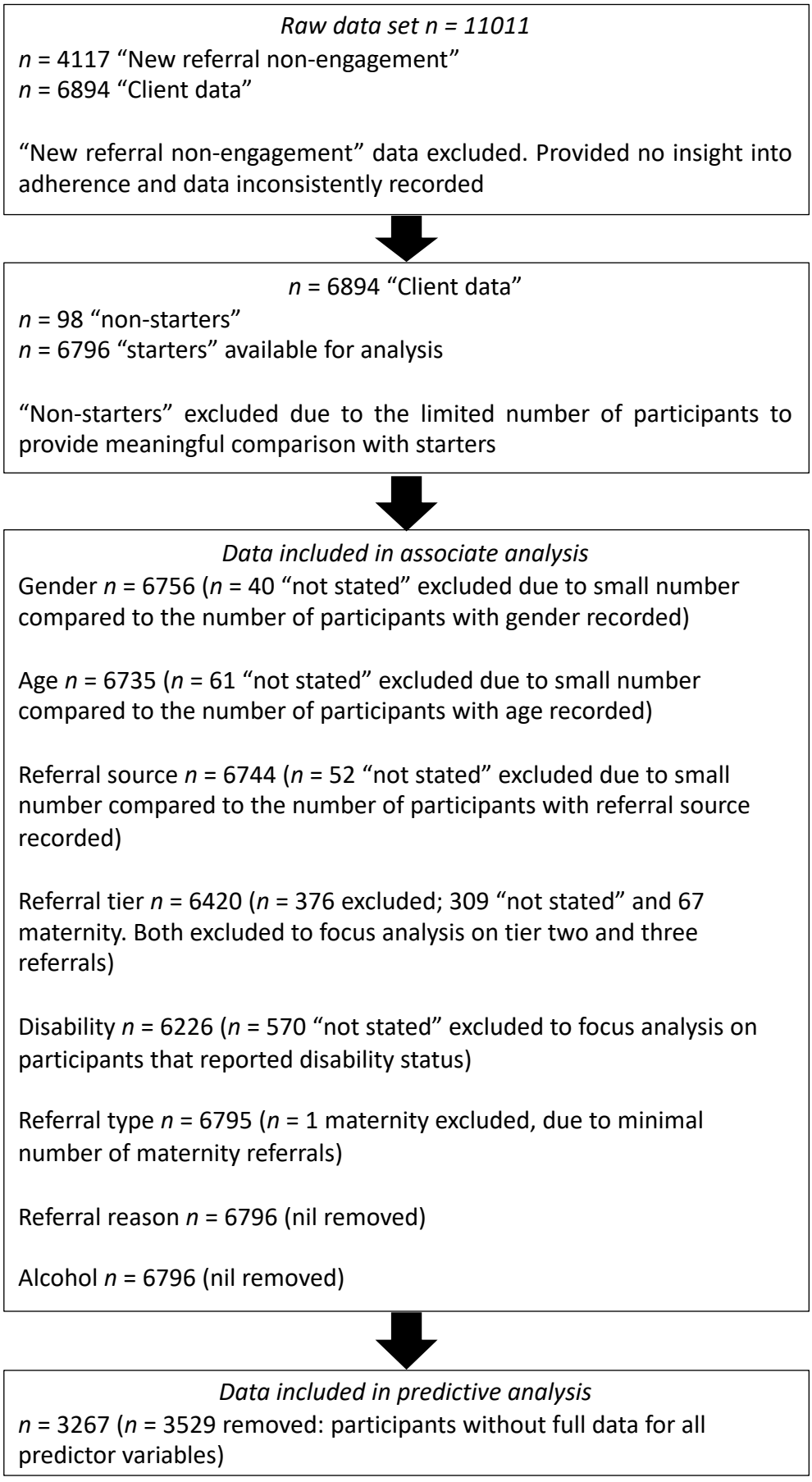
analyses. Additionally, a decision was required whether to include data (such as maternity referrals within referral type) that had been infrequently recorded.

The decision to include “not stated” was based upon the frequency it had been recorded per category. Categories frequently recording “not stated” were included, with infrequent cases excluded from analysis, as infrequent recording of “not stated” would not provide valuable insight into the relationships between participants. Therefore, data recorded as “not stated” were excluded from all analyses for gender (*n* = 40), referral tier (*n* = 309), referral source (*n* = 52) and disability (*n* = 570). Maternity (*n* = 67) cases were excluded from referral tier analysis, in order to investigate the differences between Tier 2 and Tier 3 referrals. For continuous data, all cases of “not stated” were excluded (age *n* = 61, BMI *n* = 3866 and PA level *n* = 3879), as they were not suitable for analysis.

“Not stated” was, however, included in the Chi-squared analysis of referral type (*n* = 3251) and alcohol intake (*n* = 3417), however maternity referrals were excluded from referral type, as only one referral was recorded. Referral reason analysis also included “not stated”, despite being infrequently recorded (*n* = 20), as this was incorporated into the category of “other”.

For logistic regression analyses, all categorical data (gender, referral type, referral source, tier, alcohol status, smoking status, and nine barriers) utilised as predictor variables were reduced into binary form. Therefore, all “not stated” cases were excluded, whereas in χ^2 analysis, this was not always the case (referral type, referral reason). Reducing variables to binary, resulted in maternity (*n* = 67) being excluded from referral tier (to investigate the predictive value of Tier 2/3 referrals only), and nutrition (*n* = 126) and maternity (*n* = 1) excluded from referral type (to investigate referrals for “exercise” or “both” (both included exercise and nutrition)). Referral reason was excluded entirely, as it was not possible to reduce this category satisfactorily to investigate meaningful relationships. Disability was excluded from logistic regression as all prior χ^2 analysis were non-significant. Within the 6796 participants that started the scheme, 3500 included data regarding barriers to exercise, and following removal of “not stated”, 3267 participants were included for logistic regression one and two (to predict participant dropout at 6 and 12 weeks respectively). A flow diagram (Diagram 4.1) provides an overview of the data flow from the raw data provided by the ERS, to the number of data included within the analyses, with reasons for exclusions included

Diagram 4.1. Study data flow



Appendices 3 and 4 provide full disclosure of when cases were included or excluded from analysis, including data removed due to violations of assumptions for specific statistical tests.

4.3.4 Statistical analysis

All statistical analysis was carried out using version 22 IBM SPSS for windows (SPSS, Inc., Chicago, IL).

Chi-squared (χ^2) analysis

Differences in categorical data for referral or personal characteristics between participants that adhered or dropped out were investigated using χ^2 analysis. The assumptions of χ^2 require that the data are Independent, and no expected values are below 5 (Field, 2005). If the data violated the expected values, then Fishers exact was utilised as the test statistic. In addition to χ^2, effect size and then odd ratios were calculated for statistical analysis that utilised a 2x2 contingency table. All categorical data were inputted using weight cases, with requests for: Fishers exact test, Z-tests with bonferroni method, standardised residuals and nominal including contingency coefficient, Phil and Cramer's V and Lambda.

Independent sample t-tests

Differences in scale data for referral or personal characteristics between participants that adhered or dropped out of the scheme were investigated with independent sample t-tests ($P < 0.05$ with 95% CI). All datasets were assessed to ensure assumptions were not violated, and in addition to the t-test, effect size was calculated.

Logistic regression

Binary logistic regression was used to investigate whether any personal/referral characteristics and patient self-reported barriers to exercise could predict dropout at 6 and 12 weeks, using data collected at initial assessment. Categorical data were prepared using coding to ensure consistent and clear interpretation of the results. Multicollinearity was assessed using collinearity statistics and correlation matrices to ensure there was not unacceptable intercorrelation between predictor variables. Tolerance of <0.10 and Variance Inflation Factor (VIF) >10 were set in terms of collinearity statistics and 0.70 for correlation as suggested by Pallant (2010). Cox &

Snell R^2, Nagelkerke R^2 and Hosmer & Lemeshow were utilised to investigate the model's goodness of fit. Separate binary logistic regressions were used to predict participant dropout at 6 (Logistic regression 1) and at 12-weeks (Logistic regression 2).

4.4 Results

4.4.1 Baseline characteristics of participants

Females accounted for 58.5 % (*n* = 3978) of all participants and 91.1% (*n* = 6190) were referred from primary care. 65.5% (*n* = 4454) of all participants were for a condition that was primarily cardiovascular/pulmonary/respiratory or metabolic and the mean age of all participants was 48.3 ± 15.7 years. The most commonly recorded (47.8%) referral type was "not stated" (*n* = 3249), with exercise the second most prevalent referral type (*n* = 2335, 34.4%). 2010-2011 accounted for the largest number of referrals (*n* = 1570). Table 4.3 illustrates all data regarding personal, referral, starting and completion data of all participants.

4.4.2 Starters, six week and twelve week attendance

Between April 2009 and April 2014, a total of 6796 participants were suitable for analysis. At 6-week assessment, 36.9 % (*n* = 2510) had dropped out, and by the final assessment at 12 weeks, 49.3% (*n* = 3351) had dropped out, leaving 50.7 % (*n* = 3445) of the cohort adhering. Table 4.3 provides a full breakdown for each personal and referral characteristic.

Table 4.3 Starter frequency, non-aderence frequency at 6 and 12 weeks and completion frequency by referral and personal characteristics. C/P/R/V/M, cardio pulmonary/respiratory/vascular or metabolic; PA, physical activity (number of times physically active per week ≥ 30 mins); M, male; F, female; MSK Musculoskeletal

	Started (n)	Completed (n)	Completed (%)	6/52 Drop out (n)	%	12/52 Drop out (n)	%
Gender							
Female	3978	1932	48.6	1533	38.5	2046	51.4
Male	2778	1496	53.9	957	34.4	1282	46.1
Not Stated	40	17	42.5	20	50.0	23	57.5
Age							
16-24	532	185	34.8	261	49.1	347	65.2
25-34	932	366	39.3	428	45.9	566	60.7
35-44	1233	581	47.1	477	38.7	652	52.9
45-54	1564	770	49.2	583	37.3	794	50.8
55-64	1321	798	60.4	398	30.1	523	39.6
65-74	879	548	62.3	265	30.1	331	37.7
75+	274	176	64.2	74	27.0	98	35.8
Not stated	61	21	34.4	24	39.3	40	65.6
Referral Source							
Primary	6190	3067	49.5	2335	37.7	3123	50.5
Secondary	554	360	65	148	26.7	194	35.0
Not stated	52	18	34.6	27	51.9	34	65.4
Type of referral							
Exercise	2335	1259	53.9	816	34.9	1076	46.1
Both	1158	552	47.7	459	39.6	606	52.3
Nutrition	53	13	24.5	36	67.9	40	75.5
Maternity	1	0	0	0	0.0	1	100.0
Not Stated	3249	1621	49.9	1199	36.9	1628	50.1
Reason							
C/P/R/V/M	4454	2354	52.9	1559	35.0	2100	47.1
MSK	1109	548	49.4	417	37.6	561	50.6
Other	205	104	50.7	75	36.6	101	49.3
Mental health	1028	439	42.7	459	44.6	589	57.3
Year							
2009-2010	306	137	44.8	135	44.1	169	55.2
2010-2011	1570	780	49.7	551	35.1	790	50.3
2011-2012	1366	702	51.4	508	37.2	664	48.6
2012-2013	1515	843	55.6	516	34.1	672	44.4
2013-2014	1197	658	55	405	33.8	539	45.0
2014-2015	842	325	38.6	395	46.9	517	61.4
Referral Tier							
Tier 2	3765	1856	49.3	1428	37.9	1909	50.7
Tier 3	2655	1439	54.2	915	34.5	1216	45.8
Maternity	67	13	19.4	29	43.3	54	80.6
Not stated	309	137	44.3	138	44.7	172	55.7
Disability							
No	5597	2856	51	2031	36.3	2741	49.0
Yes	629	311	49.4	236	37.5	318	50.6
Not stated	570	278	48.8	243	42.6	292	51.2
PA							
0	2955	1387	46.9	1178	39.9	1568	53.1
1	691	370	53.5	239	34.6	321	46.5
2	1038	585	56.4	331	31.9	453	43.6
3	754	414	54.9	246	32.6	340	45.1
4	369	190	51.5	129	35.0	179	48.5
5	350	190	54.3	124	35.4	160	45.7
5+	594	295	49.7	235	39.6	299	50.3
Not stated	45	14	31.1	28	62.2	31	68.9
Alcohol intake							
Non drinker	1479	703	47.5	621	42.0	776	52.5
Yes	33	13	39.4	12	36.4	20	60.6
Moderate	1540	855	55.5	498	32.3	685	44.5
Hazardous	376	206	54.8	129	34.3	170	45.2
Harmful	49	19	38.8	21	42.9	30	61.2
Not stated	3319	1649	49.7	1229	37.0	1670	50.3
Smoking status							
No	5661	3034	53.6	1931	34.1	2627	46.4
Yes	1060	388	36.6	537	50.7	672	63.4
<9	1	0	0	1	100	1	100.0
10>19	9	0	0	7	77.8	9	100.0
>20	9	0	0	7	77.8	9	100.0
Not stated	56	23	41.1	27	48.2	33	58.9
BMI							
Underweight (<18.5)	22	9	40.9	11	50.0	13	59.1
Normal (18.5-24.99)	686	341	49.7	264	38.5	345	50.3
Overweight (25-29.9)	1867	1027	55	628	33.6	840	45.0
Obese Class 1 (30-34.99)	2118	1095	51.7	777	36.7	1023	48.3
Obese Class 2 (35-39.99)	1268	612	48.3	493	38.9	656	51.7
Obese Class 3 (>40)	794	343	43.2	319	40.2	451	56.8
Not stated	41	18	43.9	18	43.9	23	56.1
Total	6796	3445	50.7	2510	36.9	3351	49.3

4.4.3 Analysis of dropout and adherence

46.1% of males and 51.4% of females dropped out, representing a significant difference between gender groups (χ^2 (1) = 18.176, P < 0.001). Cramer's V (0.52) indicated there was a medium association between gender and dropout and odds ratios indicated that females were 1.24 times more likely to dropout. Age was significantly different between groups (*t (6733)* =-14.844, P < 0.001), the mean age of those adhering being 51.1 ± 15.3 and dropping out 45.5 ± 15.5 years respectively, representing a small effect size ($r = 0.17$, $d = 0.35$).

Primary care referrals had 50.5% dropout compared with 35% of secondary care referrals, which was significant (χ^2 (1) = 48.465, P < 0.001). Odds ratios indicated that primary care referrals were 1.89 times more likely to dropout, while Cramer's V (0.85) indicated there was a high association between referral source and dropout. Referral type differed significantly (χ^2 (3) = 29.308, P < 0.001) as referrals for nutrition had the highest rate of non-completion (75.5%), compared to 46.1% of exercise referrals. Cramer's V (.066) indicated that this represented low association.

57.3% of referrals for a mental health condition dropped out, which was significantly different (χ^2 (3) = 35.275, P <0.001) compared to Musculoskeletal (50.6%), Cardiovascular (47.1%) and "other" (49.3%) referrals, representing only a low association (Cramer's V = 0.072) between referral reasons and dropout. Referral tier was significantly different (χ^2 (1) = 14.985, P < 0.001) between Tier 2 (50.7% dropout) and Tier 3 (45.8% dropout), representing a low association (Cramer's V = 0.048) and an odds ratio indicating that Tier 2 referrals were 1.22 times more likely to dropout

Those consuming moderate alcohol levels had significantly (χ^2 (5) = 28.609, P < 0.001) lower dropout (44.5%), compared with non-drinkers (52.5%), not stated (50.3%), hazardous (45.2%), harmful (61.2%) and drinkers that did not specify (60.6%). Cramer's V (0.065) indicated a low association between dropout and alcohol intake. Differences in Disability status were non-significant (χ^2 (1) = 0.568, P = 0.451) between adherers and dropouts. Analysis of smoking was not possible due to the number of zero counts within the data.

4.4.4 Predictors of 6- and 12- week dropout

Six-week dropout

The full regression model (regression two) contained 18 predictors (see table 4.5) and was statistically significant (χ^2 (18, n = 3267) = 138.657, P <0.001), indicating that it could distinguish between participants who did and did not dropout by 6 weeks. The model as a whole explained between 4.2% (Cox & Snell R^2) and 5.7% (Nagelkerke R^2) of the variance in attendance, and correctly classified 64.5% of cases, with 15.7% correctly predicted for dropouts and 92.3% for adherents.

Five independent variables made a unique statistically significant contribution to the model (Age, Alcohol (Drinker), Smoking (Yes), Tier (3), Barrier A (lack of time). The strongest predictors of dropping out at 6 weeks were smoking (OR = 1.7, 95% CI: 1.39-2.07) or being a Tier 3 referral (OR = 1.24, 95% CI: 1.05-1.47), whereas increasing age (OR = 0.98, 95% CI: 0.98-0.99), drinking alcohol (OR = 0.74, 95% CI: 0.63-0.85) or having a lack of time (OR = 0.82, 95% CI: 0.67-0.99) decreased the likelihood of dropout. These results indicated that smokers were over 1.7 times more likely to dropout controlling for all other factors in the model. Being a Tier 3 referral increased the likelihood of dropout by 1.24 times. For every additional year in terms of participant age, the likelihood of dropping out by 6 weeks decreases by 0.98 times, whereas being a drinker decreases the likelihood by 0.74 times, and having a “lack of time” as a barrier at assessment by 0.82 times.

Table 4.4 Logistic regression to predict dropout at 6 weeks. Brackets indicate dichotomous variable chosen to code as the variable considered as being present. B, beta value; OR, odds ratio; CI, confidence interval. PA, physical activity; BMI, bodymass index.

Predictor	B	P *value*	*OR*	95% *CI*
Gender (Female)	0.005	0.95	1.01	(0.862-1.173)
Age	-0.017	0.00	0.98	(0.978-0.988)
Referral type (Exercise)	-0.141	0.09	0.87	(0.737-1.023)
Referral source (Secondary)	-0.225	0.13	0.8	(0.597-1.066)
Tier (Tier 3)	0.213	0.01	1.24	(1.045-1.466)
Alcohol (Drinker)	-0.308	0.00	0.74	(0.633-0.853)
Smoking (Smoker)	0.528	0.00	1.7	(1.391-2.067)
PA	0.015	0.43	1.02	(0.978-1.054)
BMI	0.004	0.56	1	(0.992-1.016)
Lack of time	-0.202	0.04	0.82	(0.677-0.986)
Cost	-0.194	0.07	0.82	(0.67-1.013)
Lack of motivation	-0.064	0.44	0.94	(0.796-1.105)
Lack of confidence	0.090	0.38	1.09	(0.896-1.336)
Lack of support	0.393	0.10	1.48	(0.929-2.36)
Child care	-0.152	0.37	0.86	(0.616-1.197)
Transport	0.136	0.58	1.15	(0.708-1.853)
Illness/disability	0.022	0.83	1.02	(0.837-1.249)
Don't enjoy	-0.100	0.69	0.91	(0.55-1.488)
Constant	0.235	0.43	1.27	-

Twelve-week dropout

The full regression model (regression three) contained 18 predictors (see table 4.6) and was statistically significant (χ^2 (18, n = 3267) = 173.649, P <0.001) indicating that it could distinguish between participants who did and did not dropout by 12 weeks. The model as a whole explained between 5.2% (Cox & Snell R^2) and 6.9% (Nagelkerke R^2) of the variance in attendance, and correctly classified 60% of cases, with 49.1% correctly predicted for dropouts and 69.7% for adherents.

Seven independent variables made a unique statistically significant contribution to the model [Age, Alcohol (Drinker), Smoking (Yes), Tier (3), Referral source (secondary care), Barrier C (lack of motivation) and Barrier F (lack of childcare)]. The strongest predictors of dropout were smoking (OR = 1.58, 95% CI: 1.29-1.93) or being a Tier 3 referral (OR = 1.47, 95% CI: 1.25-1.73). Increasing age (OR = 0.98, 95% CI: 0.98–0.99), drinking alcohol (OR = 0.82, 95% CI: 0.71–0.95), being a secondary care referral (OR = 0.68, 95% CI: 0.52–0.90), having a lack of motivation (OR = 0.81, 95% CI: 0.69–0.95) or a lack of childcare (OR = 0.69, 95% CI: 0.50–0.95) decreased the likelihood of dropout. This indicated that smokers were over 1.5

times more likely to dropout by 12 weeks, controlling for all other factors in the model. Tier 3 referrals increased dropout likelihood by 1.47 times. Furthermore, for every additional year in terms of participant age, the likelihood of dropout decreased by .98 times. Being a drinker decreases the likelihood by .82 times, a secondary care referral by .68 times, having a "lack of motivation" as a barrier at initial assessment by. 81 times and "a lack of childcare" by .69 times.

Table 4.5 Logistic regression to predict dropout at 12 weeks. Brackets indicate dichotomous variable chosen to code as the variable considered as being present. B, beta value; OR, odds ratio; CI, confidence interval. PA, physical activity; BMI, bodymass index.

Predictor	B	P *value*	*OR*	95% *CI*
Gender (Female)	0.073	0.33	1.08	(0.927-1.249)
Age	-0.02	0.00	0.98	(0.975-0.985)
Referral type (Exercise)	-0.16	0.05	0.85	(0.727-1)
Referral source (Secondary)	-0.39	0.01	0.68	(0.517-0.895)
Tier (Tier 3)	0.384	0.00	1.47	(1.245-1.731)
Alcohol (Drinker)	-0.19	0.01	0.82	(0.712-0.953)
Smoking (Smoker)	0.458	0.00	1.58	(1.294-1.932)
PA	0.031	0.09	1.03	(0.995-1.07)
BMI	0.01	0.09	1.01	(0.999-1.022)
Lack of time	-0.18	0.06	0.84	(0.702-1.005)
Cost	-0.05	0.62	0.95	(0.779-1.162)
Lack of motivation	-0.22	0.01	0.81	(0.687-0.945)
Lack of confidence	0.162	0.11	1.18	(0.967-1.432)
Lack of support	0.08	0.74	1.08	(0.678-1.731)
Child care	-0.37	0.03	0.69	(0.499-0.953)
Transport	0.089	0.71	1.09	(0.681-1.755)
Illness/disability	0.019	0.85	1.02	(0.839-1.238)
Don't enjoy	-0.21	0.40	0.81	(0.201-1.314)
Constant	0.46	0.11	1.58	-

4.5 Discussion

This study aimed to retrospectively analyse the ERS adherence rate and investigate if personal or referral characteristics were associated with, or could predict dropping out or completing the scheme. This phase also aimed to provide a quantitative starting point for the thesis.

4.5.1 Dropout/Adherence

Data for 6796 participants were available for analysis, which to the author's knowledge is the largest to date.

This study supports the notion that ERS suffer from dropout, a consistent finding within the ERS literature. Adherence was 50.7%, similar to the most recent publications, including a retrospective analysis (42.9%) (Hanson *et al.*, 2013), RCTs of 45% and 43.8% (Tobi *et al.*, 2012; Murphy *et al.*, 2012) and systematic reviews of 49% (Pavey *et al.*, 2011a; Pavey *et al.*, 2012). However, this study investigated an ERS lasting 12 weeks, whereas Hanson *et al.* (2013) investigated a scheme lasting 24 weeks, Tobi *et al.* (2012) 20-26 weeks, Murphy *et al.* (2012) 16 weeks, and an average 10-12 weeks as reported by Pavey *et al.* (2011a). Schemes of longer duration could potentially have less adherence due to increased requirement for commitment over a longer time.

The largest proportion of dropout occurred in the first half of the ERS. Between initial and 6-week assessment, 36.9% dropped out, compared to an additional 12.4% dropout between weeks 6 and 12 in the second half of the ERS. Although run over 24 weeks, Hanson *et al.* (2013) reported a similar finding, whereby the highest dropout rate occurred in the first half of the ERS, with an additional 10.5% dropout in the second half. This current study and Hanson *et al.* (2013) are the only studies to report half way assessments, therefore, no other comparisons are possible.

4.5.2 Adherents vs dropouts

Females recorded the most dropout, and dropouts were younger than adherent participants. This is in agreement with James *et al.* (2008), Pavey *et al.* (2011a), Pavey *et al.* (2012) and Campbell *et al.* (2015), and partial agreement with Dugdill, Graham and McNair (2005), Sowden *et al.* (2008), James *et al.* (2009) and Moore *et al.* (2013), where older participants were more likely to complete.

Primary care referrals accounted for the most dropouts, with referrals for nutrition and referrals with a mental health condition accounting for the most dropouts within their respective analyses. Data for primary/secondary care referrals and referral type are novel, therefore it is difficult to make comparisons, and further research into this area is required.

Referral reasons for mental health conditions have been cited as suffering from lower adherence (compared to other referral reasons included in their respective studies) by Dugdill, Graham and McNair (2005), Crone *et al.* (2008), Moore *et al.* (2013) and Tobi, Kemp and Schmidt (2017). However, in contrast, Hanson *et al.* (2013) reported that referral reason was not a predictor of adherence. James *et al.*

(2009) reported participants with referral reasons for pulmonary issues were more likely to complete compared to cardiovascular referral reasons, and within the analysis, mental health referral reasons were non-significant. Sowden *et al.* (2008) reported on referral reason, associating cardiovascular referrals with adherence, whereas in this study, 52.9% adhered, however, did not include mental health referrals. As previously discussed, comparison of referral reasons with the literature is difficult due to the heterogeneity of reporting.

Tier 2 (low risk) referrals, and participants reporting to have harmful levels of alcohol intake had significantly higher dropout compared to Tier 3 or other alcohol (including hazardous) intake levels. This analysis is novel within the ERS literature, as no other studies have reported data regarding different tiers of participants in terms of risk (of co-morbidities) or alcohol intake in relation to ERS adherence, therefore no comparisons are possible.

4.5.3 Predictors of adherence/dropout

To date, there is limited research regarding predictors of adherence/dropout. As highlighted by Pavey *et al.* (2011a) and Pavey *et al.* (2012) the majority of research has focused on gender and age as predictors of adherence. To date, Hanson *et al.* (2013) has been unique in utilising multiple personal and referral characteristics to predict adherence at multiple time points within an ERS. This current study utilised a similar approach, however, included a wider range of personal and referral characteristics, including self-reported barriers to exercise, which is unique to the ERS literature.

Within the two models used to predict dropout at 6 and 12 weeks, four variables were consistently able to make significant contributions. Two consistently made a positive prediction for dropout (the predictor increases likelihood of dropout) at 6 and 12 weeks, and two negatively predicted dropout (the predictor decreases the likelihood of dropout) at 6 and 12 weeks. Four other variables made significant contributions to the models for 6 and 12 weeks, but were not consistent across each model, and all made negative predictions regarding dropout. Of all the variables included within the models, only two positively predicted dropout, whereas all others negatively predicted dropout.

Positive predictors of dropout

Cigarette smokers and Tier 3 referrals were positive predictors of dropout, and not only the strongest, but the only constant predictors of dropout at 6 and 12 weeks. However, due to a paucity of research using predictor variables beyond gender and age, making comparisons to these findings is difficult.

Only one other study (Taylor, Doust and Webborn, 1998) has considered smoking in relation to ERS adherence, where smokers had lower adherence compared to non-smokers. Beyond ERS research, smokers have associations with poor attendance to health checks and groups to reduce the risk of cardiovascular disease (Pill *et al.*, 1988; Davies, Pyke and Kinmonth, 1994), compared to non-smokers.

The analysis of Tier 2 and 3 participants within ERS is unique, therefore comparison to other studies is difficult. However, Picorelli *et al.* (2014) reported that participants with a lower number of health conditions/medication had higher exercise programme adherence rates compared to participants with more health conditions/medication. Forhan *et al.* (2013) investigated the relationship between obesity, type 2 diabetes and adherence to cardiac rehabilitation programmes, reporting that participants with both conditions had the highest levels of non-adherence. Additionally, when controlling for no other factors other than type 2 diabetes, obesity, or a combination of both, having both conditions was the strongest predictor of non-adherence, while participants with increased body fat percentage/waist circumference were predictors of non-adherence. This would support the notion that those with multiple comorbidities are less likely to adhere to exercise interventions. However, it must be noted that one regression model in Forhan *et al.* (2013), did not find a combination of diabetes and obesity to predict non-adherence, when combined with other variables (socio-demographic, psychological, fitness levels and resting physiology data), therefore the finding should be interpreted with caution.

Considering the findings of the current study, as well as Picorelli *et al.* (2014) and Forhan *et al.* (2013), it would suggest that participants with multiple or moderate-high levels of comorbidity may not be suitable for ERS in their current guise. However, this would not explain why younger participants (who are presumably less likely to have multiple comorbidities) are less likely to adhere to ERS. It may be the case that those with multiple comorbidities, or higher risk populations (i.e. Tier 3 referrals) require a more nuanced or tailored approach regarding ERS.

Negative predictors of dropout

-Personal or referral characteristics

Alcohol consumers, and increasing age were negative predictors of dropout at both 6 and 12 weeks. Alcohol consumption has not been investigated in the context of ERS adherence, therefore direct comparisons are not possible. However, a systematic review by Giesen, Deimel and Bloch (2015), reported adherence rates of 66-74% to exercise interventions in patients with alcohol use disorders, which is elevated compared to ERS adherence. Comparison should be made with caution, as the study only included patients with alcohol use disorders, excluded social drinkers, and did not include programmes considered as ERS.

Increasing age has commonly been reported as a predictor of adherence within individual studies (Leijon *et al.*, 2011; Murphy *et al.*, 2012; Tobi *et al.*, 2012; Hanson *et al.*, 2013), and systematic reviews (Pavey *et al.*, 2011a; Campbell *et al.*, 2015). Despite increasing age being a predictor of scheme adherence, the cohort as a whole comprised of 36.6% participants aged over 55 years old.

Of the 3267 participants included in the regression analysis, 37.7% were 55 years or older. Hanson *et al.* (2013) also reported a similar finding, the minority (48%) of a cohort being over 55 years, yet increasing age still predicted adherence. This current study and the findings of Hanson *et al.* (2013), support the notion that future ERS could focus on participants 55 years or older, or that further investigation of or targeting ERS for the under 55s is required.

At present, there is no available research regarding secondary care referrals as they have been excluded from most studies and recent systematic reviews (Pavey *et al.*, 2011a; Campbell *et al.*, 2015). Despite secondary care referrals being in the minority of this study (8% of entire cohort, 9.6% included in the regression analysis), these referrals made a significant contribution to the model, indicating that secondary care referrals were less likely to dropout at 12 weeks. The reason for secondary care referrals being less likely to dropout at 12 weeks and not at 6 weeks is not understood, there is also a lack of understanding why secondary care referrals are less likely to dropout at 12 weeks, and requires further investigation.

-Self reported barriers to exercise

The use of participant self-reported barriers to PA with the aim of predicting dropout/adherence is novel and is a direct attempt to address the lack of knowledge regarding barriers to ERS adherence, as identified by NICE (2014b).

Three out of nine self-reported barriers made significant contributions to the regression models. At 6 weeks, “a lack of time” predicted a decrease in likelihood of dropping out, whereas “a lack of motivation” and “a lack of childcare” predicted a decrease in dropout likelihood at 12 weeks.

However, consideration of barriers within ERS is not unique. A lack of time and motivation have been cited as barriers to adherence at 3-month follow-up (Leijon *et al.*, 2011). However, comparison to this study is limited, as the barriers were recorded following dropout, not at initial assessment. A recent systematic review by Kelly *et al.* (2016b) reported that a lack of time or lack of motivation were cited as barriers to PA in middle aged people, including conflicting demands of childcare or the responsibility of having a child. A lack of motivation was cited by Jones *et al.* (2007) as an influence on low attendance in cardiac rehabilitation, and a lack of time in Morton, Biddle and Beauchamp (2008). However, this current study differs to each, making direct comparisons difficult, as Kelly *et al.* (2016b) did not focus exclusively on ERS participants, Jones *et al.* (2007) assessed participants in cardiac rehabilitation, and Morton, Biddle and Beauchamp (2008) assessed barriers following dropout.

Interestingly, the variables highlighted in the literature as barriers (motivation and time), were also highlighted in this current study. However here, they counterintuitively predicted adherence, not dropout, and is a novel finding. A possible explanation, is that the ERS could have provided the time and motivation to exercise, therefore participants selecting these barriers were more likely to adhere. This explanation is based upon predictors that are significant, however, are amongst the weakest within the logistic regression models and cannot be supported by other literature. Additionally, “a lack of time” only predicted adherence up to six weeks, not twelve. Further investigation into why a lack of time or motivation is a predictor of adherence is required.

While increasing age to predict adherence has been reported in other studies, this study has not replicated the findings of Pavey *et al.* (2011a), Hanson *et al.* (2013) or Campbell *et al.* (2015), where gender, BMI or referral reasons have been

predictors of uptake and/or adherence. Explanations as to why this is the case are lacking, though the different duration of the ERS compared Hanson *et al.* (2013) or the range of studies included within the reviews by Pavey *et al.* (2011a) and Campbell *et al.* (2015) may have had an impact.

4.5.4 Rationale for non-adherence

Some of the findings within this study are comparable to the extant research, including overall scheme adherence, or trends within characteristics such as age, gender and mental health referrals, as highlighted in sections 4.5.1-4.5.3. However, the rationale attempting to explain these findings has not been discussed and is therefore included in this section.

Increasing age is one of the few variables commonly associated with adherence within ERS research, which was the case in this study. Although not investigated within ERS, there appears to be a difference in motivation to exercise between older and younger adults. Motivation to start exercising has been described by older adults to include regaining or maintaining mobility, and avoiding losing strength (Bethancourt *et al.*, 2014; Kanavaki *et al.*, 2017). Motivations to keep exercising include maintaining mental acuity, independence, increasing longevity, and to be able to keep up with grandchildren (Bethancourt *et al.*, 2014; Franco *et al.*, 2015). It appears that for older adults, the motivation to exercise is to support healthy aging. Hickey and Mason (2017) compared the motivators for exercise between age groups, and also reported that older adults were motivated by health reasons, whereas this was not the case for younger adults. Younger adults appeared more motivated by affiliation, mastery and enjoyment (Hickey and Mason, 2017) which may be important, but may not be as a strong motivator as healthy aging, which may partly explain higher adherence in older adults. Interestingly, a lack of time was not cited as a barrier by older participants in Bethancourt *et al.* (2014). This may be because older adults are more likely to be retired, with more time and opportunity to exercise (Kosteli, Williams and Cumming, 2016). Conversely, younger adults are more likely to be working full time and, therefore, have limited scope for flexibility within their schedule, which is a proposed barrier to adherence within cardiac rehabilitation (Gaalema *et al.*, 2017). Berry, Aucott and Poobalan (2018) have also reported that time and cost are barriers to exercise for younger adults. Although not specific to an age group, flexibility at work and sufficient time, is associated with exercise adherence in adults with mild-moderate depression (Helgadóttir *et al.*,

2018), therefore may impact adherence across age ranges. Finally, education and information appear to be important for younger adults. Younger adults are more like to exercise if they perceive more benefits from participating (Hickey and Mason, 2017). However, it appears that a lack of healthy living messaging and information is an issue for younger adults, as it has been cited as a barrier exercise (Berry, Aucott and Poobalan, 2018). It appears that the reasons for lower adherence in younger adults is multifactorial. It may be the case for younger adults, that the motivators to exercise are not sufficiently strong enough, there may not be sufficient flexibility with work to attend, and that there is insufficient information to support adherence. However, these explanations have not been established within ERS participants. Investigating why younger adults are less likely to adhere would provide valuable information to support their experience and provide suggestions to improve ERS for them.

Within this study, female adherence was lower than that of males, and this finding has been reported within ERS research (Dugdill, Graham and McNair, 2005; Gidlow *et al.*, 2007; James *et al.*, 2008), albeit less commonly than the association between increasing age and adherence. Qualitative research within ERS has not focused on the reasons for this. However, there are some potential explanations. van Uffelen, Khan and Burton (2017) reported that females were less likely to prefer or be motivated by PA activities that are competitive or vigorous. In addition, the study reported that females were motivated towards PA to meet or make friends, and that they preferred supervised activities. Support from other females to attend the gym has been reported as important, where females have dropped out following a training partner ceasing to attend (Pridgeon and Grogan, 2012). Females have been reported to be more negatively affected by making body image comparisons to other users in the gym, if they already had poor body satisfaction (Pridgeon and Grogan, 2012).The gym may be stereotyped as a masculine environment, which has been reported as a concern by females prior to attending (Pridgeon and Grogan, 2012), and parts of the gym have been reported to have been gendered - that is certain parts of the gym are perceived to be for males, and others for females, which constrains where participants feel comfortable to exercise (Coen, Rosenberg and Davidson, 2018). Taking these factors together, it could be the case that in the ERS, the gym environment may not make females feel comfortable to attend, and supervision or further support is needed. Additionally, as the majority of ERS referrals are at varying degrees of obesity, there is potentially more likelihood that they have poor body satisfaction, which may have a detrimental effect on adherence,

if they compare themselves to other gym users. Finally, the perception of, and within the gym may be a barrier for females. If females perceive the gym to be a male domain, or certain part of the gym for males only, then this could also be a barrier to attendance.

Smokers within this study were more likely to dropout compared to non-smokers. Smoking has been associated with lower adherence in ERS (Taylor, Doust and Webborn, 1998), exercise interventions (Helgadóttir *et al.*, 2018) and cited as a predictor of non-adherence for a range of other interventions including cardiac rehabilitation (Gaalema *et al.*, 2017) and adherence to statin and chemoprevention medication (Warren *et al.*, 2013; Smith *et al.*, 2016). However, it is not clear why smokers have limited adherence compared to non-smokers. Gaalema *et al.* (2017) suggested that it may not be surprising that smokers are less likely to be adherent to interventions, as it may be the case that the best predictor of a negative health behaviour, is participation in another negative health behaviour. Helgadóttir *et al.* (2018) provided a similar explanation, in that smokers are typically associated with less healthy lifestyles, with low physical activity and less readiness to change. These suggestions appear feasible to explain the findings within this study; participants are referred often because they are insufficiently active, and/or overweight, meaning smokers have a negative health behaviour in addition to these factors. Therefore, for smokers, change may be more difficult. As smokers are less active, they have a higher perception of exercise exertion, compared to non-smokers (Vozoris and O'donnell, 2015), meaning exercise will feel more difficult or tiring for smokers, and may be a reason for reduced adherence to PA (Helgadóttir *et al.*, 2018). An additional factor is that smokers are typically from lower socioeconomic backgrounds (Hiscock *et al.*, 2012) which, therefore, may mean attendance to an ERS is financially prohibitive.

Although not always consistently shown, a pattern within the research suggests that participants with mental health conditions have lower adherence, which was the case within this study. Specific to ERS, there appears to be no investigation to explain this. However, in the wider literature, studies have considered preferences of individuals with mental health conditions and why they are less physically active. Paterson and Chapman (2013) reported that participants with mental health conditions would prefer to be guided through exercise sessions, while barriers to PA were poor physical and mental health and a lack of money. Other barriers to PA, that were associated with psychological distress, included feeling too tired, exercise

causing exhaustion, feeling shy/embarrassed and not being able to get organised. A systematic review and meta-analysis by Firth *et al.* (2016b) investigating the facilitators and barriers to PA within patients with severe mental health illness, reported similar findings, where poor health, tiredness, stress/depression were cited as barriers to PA. A lack of support was also cited a barrier as the most prominent socioeconomic barrier to PA. Anxiety towards the exercise environment and a lack of exercise efficacy has also been cited as a barrier (Firth *et al.*, 2016a). Support appears to be important for participants with mental health conditions, and appears to be commonly cited within the literature, and is not limited to support from staff (Soundy, Kingstone and Coffee, 2012) but also peers (Firth *et al.*, 2016a). Supervised mental health participants are also associated with greater adherence (Stubbs *et al.*, 2016; Vancampfort *et al.*, 2016). While unsupervised exercise may be less resource intensive and appropriate for some populations, this may not be the case for participants with mental health conditions (Firth *et al.*, 2016b). While ERS provide support, it is not through every session or exercise, or typically with peer/support groups. For participants with mental health conditions, there may not be sufficient support, and may be a reason why they appear to have reduced adherence compared to other referrals.

Moving beyond discussion relating to demographic or health factors, it is important to consider the complexity of changing sedentary behaviour or managing negative health behaviours or risk factors. An aim of ERS is to increase PA (Hanson *et al.*, 2013), often in response to the presence of risk factors for conditions such as CHD or CVD (Dugdill, Graham and McNair, 2005; Pavey *et al.*, 2011c), and ERS attempts to manage the risk factors through PA. The risk factors often include, but are not limited to, being sedentary, obese, hypertensive or a smoker. Within this study, 5563 (81.9%) referrals were based upon cardiopulmonary, respiratory, vascular metabolic or musculoskeletal conditions, and 6047 (89%) of all participants were varying classifications of obese, 1079 (15.9%) smoked and 2655 (39.1%) had moderate-high levels of comorbidities. The analyses indicated that smokers and Tier 3 referrals were the most likely to dropout, while mental health referrals suffered from significant numbers of dropout. Therefore, participants that stand to benefit the most from a referral, appear to dropout the most.

The notion of using PA to improve physical conditions has been questioned. Hutchison and Johnston (2013) suggested that although sedentary behaviour may result in physical health problems, the behavioural issues causing the sedentary

behaviour may be complex and individual. Despite having a diagnostic label which serves to describe the participants' physical difficulties, ERS do not address the underlying psychological mechanism that causes these difficulties. This results in a physical programme being offered for a psychological problem.

For example, weight loss is often a risk factor identified to initiate referrals, and weightloss alone is challenging (Burmeister *et al.*, 2013), without taking into consideration other comorbidities that may be present. Metabolic vulnerabilities to obesity (Wing and Hill, 2001) and food addiction, that are comprised of behavioural and neurophysiological components (Burmeister *et al.*, 2013), have been suggested as limitations to weight loss, highlighting the complexity of the problem, which may not have a purely physical solution. Thurston and Green (2004) have suggested that ERS need to understand the social, cultural, demographic and economic influence of individuals' actions to enhance adherence, not just the physical aspects.

In the context of this study, a significant proportion of the cohort suffered from a cardiovascular/metabolic condition, and while a PA increase may be beneficial, it may not address the underlying issues. Therefore, for some participants in this study, using a physical intervention in isolation, may explain the increased likelihood of dropout within the cohort.

4.6 Limitations

Every effort was made to include, where possible, all data provided by the ERS for analysis. All data had been routinely collected, without a specific research purpose, and was secondary data. This resulted in a heterogenous dataset, where outcome measures were inconsistently recorded and included missing or erroneous entries, which is a common issue with routinely collected data (Fisher *et al.,* 2013). The outcome was that only 3267 of a possible 6796 participants had full datasets.

For some analysis (e.g. gender) this was not problematic, however, others such as referral type, over 3000 cases of "not stated" were recorded. The impact for analysis, was an inability to investigate associations across the many variables recorded by the ERS over a five-year period. The number of "not stated" cases made interpretation of some analyses difficult. The effect of this is seen in Tier 2/3 analysis. Chi-squared analysis included 6420 participants, suggesting Tier 2 referrals were more likely to dropout. Conversely, logistic regression only included 3267, but included more variables into the model, suggesting that Tier 3 referrals increased

dropout likelihood. This resulted in an inability to draw associations across the many variables involved in this ERS, making interpretation difficult. Using only 3267 of the available 6796 participants resulted in logistic regression models that could predict dropout, but could only predict up to 60% of dropouts, as the variables only provided a minimal increase in predictive accuracy. Because of this and the low Cox & Snell R^2 and Nagelkerke R^2 values, in conjunction with the limited ability to predict dropouts, this suggests that other factors beyond the variables included in the model have an influence on dropout rates.

Research in ERS has often analysed “uptake”, commonly defined as “attendance at initial consultation and one or less exercise session” (Pavey et al., 2012) or “Initial attendance, take up or enrolment following a referral” (Campbell, 2015). The ERS provided data relating to uptake for each of the five years, termed “did not engage”. However, these data contained many missing or inconsistent data entries. Because of this, it was not possible to determine if a participant had accepted a place on the scheme, or had been referred and ultimately not contacted the scheme, making analysis of uptake impossible using the aforementioned definitions.

Using self-reported measures, such as alcohol intake and PA levels introduces recall bias (Ainsworth et al., 2012), therefore these findings should be interpreted with caution. The self-reported barriers, recorded at initial assessment, were barriers that could prevent increasing PA levels, however, it is not known if they changed during the scheme. Therefore, the barrier cited at initial assessment, may not have manifested itself, making it impossible to understand if it impacted dropout or not. It is also conceivable that participants overcame what they perceived to be barriers, partly explaining why some barriers predicted adherence. Finally, the ERS offered only nine potential barriers to choose from. It is conceivable that more than nine barriers exist, allowing participants to choose their own could have provided more accurate information.

The self-reported PA scores should also be interpreted with caution. Aside from recall bias in self-reported measures, the method used to record PA could potentially underestimate the time participants spent physically active. Participants were required to state how many times they were active for 30 or more minutes per week, and recorded this between 0-5 and ≥5 times. This measurement is only sensitive enough to estimate the minimum PA levels, as opposed to the actual amount. A participant could have been physically active for 60 minutes on 3 occasions per week, but recorded as 3 only, despite exceeding the recommended time of PA per

week. Future studies could consider more accurate/sensitive measures of PA levels, or how many attendances to the scheme facilities, to provide a more accurate PA representation.

This study was only able to analyse data at final assessment, and would be improved by longer term follow-up. Although the scheme did collect follow-up data at 3 and 6 months following the final assessment at 12 weeks, the dataset was not numerous or consistent enough for analysis. It is, however, important to state that the aim of this paper was to analyse dropout predictors as opposed to long-term effectiveness.

4.7 Implications for practice

The findings of this study suggest that participants over the age of 55, males, participants that do not smoke, and secondary care referrals are associated with more successful referrals through increased adherence, whereas participants with mental health conditions, and to a lesser extent, females, are not.

Understanding which participants are more likely to adhere to an ERS, provides referrers with more information to decide who to refer into a scheme, with more confidence. These findings could, therefore, be used to support referrals for older participants, males and non-smokers. However, in light of the relatively limited effect sizes and predictive strength of the analyses, it is inappropriate to suggest using these findings to exclude female participants or those with mental health conditions from being referred to an ERS. It may be that professionals considering a referral for a female or a participant with a mental health condition, may require discussion with the participant about the suitability of referral and what the ERS itself may entail in more detail, for example.

However, these findings do not, and are not able to, consider why participants do not adhere, particularly those participants that have personal or referral characteristics associated with dropout. This highlights the limitations of using quantitative research in isolation, and that other factors which are not included in the quantitative modelling are important to investigate. Therefore, qualitative research to investigate why participants dropout is required, to understand what other factors may influence dropout, and in turn, support more successful referrals to decrease dropout.

4.8 Conclusion

Participant dropout was nearly 50%, with smokers and Tier 3 referrals predictors of dropout at 6 and 12 weeks. The majority of dropout occurred within the first 6 weeks, and younger participants were more likely to dropout, whereas alcohol drinkers and secondary care referrals were more likely to adhere. Participants citing a barrier to exercise of “a lack of time” predicted presence at 6 weeks, whereas “a lack of motivation” or a “lack of childcare” predicted 12 week adherence. Further research investigating why participants, particularly younger participants within the first six weeks dropout, is required in addition to identification of barriers to adherence.

Chapter Five: Qualitative analysis of barriers to adherence and facilitators of adherence

5.1 Background

Exercise Referral Scheme (ERS) research has predominantly been quantitative (Hanson *et al.*, 2019), with limited exploration of ERS participants views, as highlighted in the recent reviews focusing on the views of adherent participants (Morgan *et al.*, 2016; Eynon *et al.*, 2019). The quality, and lack of depth and diversity within qualitative ERS research has been questioned (Williams *et al.*, 2007; Gidlow *et al.*, 2008; Pavey *et al.*, 2011a; Moore *et al.*, 2013). There has been limited investigation into why participants do not adhere and how to improve adherence. None of the studies included in Morgan *et al.* (2016) and Eynon *et al.* (2019) focused specifically on the views of non-adherers, with the exception of Martin and Woolf-May (1999), who reported that illness, injury and time pressures were reasons for non-adherence. However, no detail beyond stating these as reasons for non-adherence was discussed, providing limited insight into how this information could be used to support adherence. As identified in the literature review, no other studies appear to have aimed to investigate populations which appear to be at most risk of poor adherence. Although some studies did include the views of non-adherers (Lord and Green, 1995; Stathi, McKenna and Fox, 2004; Taket, Crichton and Gauvin, 2006; Sharma, Bulley and van Wijck, 2012), none had specifically recruited these participants to understand their reasons for not adhering to the scheme. Pentecost and Taket (2011), which was not included in Morgan *et al.* (2016) or Eynon *et al.* (2019), did however recruit non-adherent and adherent participants from the same ERS, however did not specifically recruit participants that were at risk of dropout, or focus on why participants dropped out. Birtwistle *et al.* (2018) recruited participants that did not uptake, to understand the factors influencing uptake, however, did not include non-adherers, providing insight only on uptake. A range of studies have investigated the experiences of successfully adherent ERS participants (Mills *et al.*, 2013; Moore *et al.*, 2013; Eynon, O'Donnell and Williams, 2018) however, no previous work has purposefully compared the experiences of non-adherers and adherers within the same ERS. Gaining insight into why some participants adhere, whereas others do not, despite attending the same ERS, could provide more

detailed understanding of how to improve adherence, by understanding what did (or didn't) work for participants.

The findings reported in chapter four and published (Kelly *et al.*, 2016a) (See appendix 12), indicated that most dropout occurred within the first 6 weeks and that increasing age predicted adherence. Similar findings have been reported in the literature, where dropout is greater in the first half of an ERS (Hanson *et al.*, 2013), and increasing age is a predictor of adherence (Leijon *et al.*, 2011; Murphy *et al.*, 2012; Tobi *et al.*, 2012; Hanson *et al.*, 2013; Campbell *et al.*, 2015). Chapter four also reported that participants citing "A lack of motivation" or "A lack of childcare" at the initial assessment, were more likely to adhere to the programme. This finding was counterintuitive and unique within the ERS research. The findings from chapter four underpin the rationale for participant recruitment within this chapter. Appropriate recruitment will provide the opportunity to understand the findings from chapter four that cannot be explained by the current literature.

Some of the key chapter four findings, which cannot be explained by the literature, mirror the suggested areas for future research by some of the key publications in ERS, namely Williams *et al.* (2007); Pavey *et al.* (2011a); Hanson *et al.* (2013); NICE (2014b); and Campbell *et al.* (2015), who have earmarked the following research priorities:

- Why ERS are less successful for certain groups, especially younger participants.
- What factors encourage uptake and adherence, including any barriers preventing participation, with a particular need for in-depth research into the barriers to participation in exercise schemes.
- Understand how the schemes improve motivation and reduce barriers in those who do attend.

These research priorities will be used in conjunction with the findings from chapter four to inform the aims of this chapter.

5.2 Aims

The study will revisit the South Tyneside ERS with the aims of:

- Understanding why participants dropout of the scheme, in particular those under 55 that dropout within the first 6 weeks.
- Increasing the understanding of what the barriers to adherence are.
- Increasing the understanding of what the facilitators to ERS adherence are.
- Exploring how to overcome/facilitate overcoming the barriers and enhance the facilitators.
- Exploring how ex-participants, both adherent and non-adherent, would improve the scheme for future participants.

5.3 Method

5.3.1 Overview

As part of this mixed methods thesis, this chapter constitutes the qualitative study, and is composed of two qualitative methods: Semi-structured in-depth interviews and a focus group. This chapter consists of two sections. The first being the semi-structured interviews, which recruited participants that were non-adherent to the ERS, under 55 years old, who dropped out within the first 6 weeks. The second section is the focus group that collected views of adherers to the ERS.

5.3.2 Recruitment source, ethics and ethics amendment

During the development of the first study (chapter four), an agreement was reached to conduct a qualitative study using participants from the South Tyneside ERS. Ethics (submitted on 6th July 2016) was approved on 13th July 2016 (HLSMK060716: Exercise Referral Scheme: Participants perceptions of barriers and facilitators to Exercise Referral Scheme Adherence). Due to limited recruitment from July 2016 until December 2016 (see details below section 5.4.2), an ethics amendment was submitted to change the recruitment methods and extend the recruitment period. The amended ethics application was accepted on the 3rd of January 2017 (HLSMK060716: Appendix 5)

5.4 Part one: Semi-Structured individual in-depth interviews

5.4.1 Design and sampling

Individual interviews were utilised as they are suited to gain a personal account and afford privacy (Yeo *et al.*, 2014) for discussion about topics such as motivation, decision-making and other content related to their experiences which could be sensitive to the participant. A focus group was considered, to gather multiple participants and collect data within one event. However, this approach is open to insufficient recruitment, if participants do not attend. As one recruitment criterion for this study was a history of non-attendance on the ERS, using a focus group was considered inappropriate due to the likelihood of non-attendance and risking insufficient recruitment. Individual interviews were therefore chosen to manage this potential issue.

Purposeful sampling was utilised to ensure that the participants recruited could provide insight into the experiences of dropping out of the scheme. Maximum variation purposive sampling was utilised, to gain a diverse variation of opinions within the group (Green and Thorogood, 2018) across gender and age. Therefore, recruitment focused on gaining a minimum of 2 participants in each of the following age groupings: 18-24, 25-34, 35-44, 45-55, with an equal distribution of males and females.

5.4.2 Sample size and Recruitment

Only two selection criteria were present in this study (18-55 years old and dropped out of the ERS within the first six weeks). With limited selection criteria, smaller group sizes are justified (Ritchie *et al.*, 2014b), therefore recruitment aimed to gain 10-12 participants. Additionally, Adler and Adler (2012) suggest that a sample size of 6-12 is suited for harder to access populations, and as the participants within this research had a history of non-attendance, it was decided that numbers of above 12 may be difficult to recruit. Although sample sizes for individual interviews can range between 1-60 (Adler and Adler, 2012; Creswell, 2014), larger sizes can become unmanageable for data collection and analysis (Creswell, 2014), and the recruitment and analysis of more than 12 participants would not be feasible for the scope of this thesis. The first participant was used as a pilot interview, and the data included in the analysis, because in contrast to quantitative research, the pilot data does not need to be discarded (Arthur *et al.*, 2014). The scheme did accept participants under

18 years old, however they represented a minimal number of referrals (84 in 5 years), and therefore participants under 18 were excluded from the study.

Potential recruits were identified using the South Tyneside ERS electronic database. The database was used to filter participants aged between 18-55 years old who had dropped out of the scheme within the first 6 weeks of starting. A Microsoft Excel file was used to populate a list of the identified potential recruits, including their addresses and contact details, and was secured within the ERS safeguarded PC network (as per ethical agreement). To minimise the likelihood of recall bias and having recent contact details/addresses, only those who had dropped out of the scheme within the last year were approached in the first instance.

Recruitment started by posting a cover letter explaining why contact was being made, together with a participant information form, a consent form, and reply slip (See Appendix 6). These “recruitment packs” were posted in blocks of 20, and where possible, each contained five participants falling into each of the age groups across males and females, to include a range of individuals within the inclusion criteria. However, not all blocks contained equal numbers of males and females, as the filtering process revealed more females had dropped out of the scheme within the first 6 weeks. Block posting of recruitment packs was carried out to gradually contact participants, therefore avoiding a potential glut of responses, which would have been problematic in terms of completing all interviews in a timely manner. Each recruitment pack contained a reply slip and offered the recipient a choice of contact method. Once this slip was returned, contact was made with the participant via phone or email (participant preference) to discuss the research in more detail, and to agree a time to conduct the interview.

Participants were offered a choice of location to conduct the interview, either at their home or the ERS assessment hub. This choice was provided to facilitate the recruitment process, providing more choice to suit the participants’ individual circumstances. This also provided an opportunity for interviews to be completed in a location not associated with the scheme, therefore minimising any potential unease of returning to a location, where the participant had previously stopped attending.

Insufficient recruitment was acknowledged as a possibility. Therefore, to keep within the thesis scope, recruitment following one final call for participants was initially planned to cease on the 1st February 2017. Between July 2016 and December 2016,

a total of four replies from approximately 140 recruitment packs were received, with one interview completed. The three other replies did not attend for interview or did not answer follow-up phone calls to agree a date for interview. By December 2016, it was clear that the number of required interviews would not be completed by 1st February 2017. Therefore, the recruitment strategy and interview method was revaluated, resulting in an ethics amendment. The new strategy initiated contact via telephone, not postal recruitment packs. The time since dropout was extended from 1 to 2 years, to avoid calling participants who had already been contacted by postal recruitment packs.

Appendix 7 provides an example of the script used during the call, which included detailed information regarding informed consent. There were four outcomes of the telephone recruitment call: 1) the person declined to participate, 2) the person undertook the interview over the phone during the recruitment call, 3) the person requested a telephone interview at another date and 4) the person requested a face to face interview. Although telephone interviews were not the preferred choice (as discussed in chapter 3), they are a recognised method of interviewing (Cachia and Millward, 2011; Mealer and Jones, 2014) and due to insufficient recruitment, were utilised. The telephone recruitment strategy and interview method was more successful and sufficient interviews were completed by the new cut-off date of 30th August 2017. All interviews took place between October 2016 and May 2017. Table 5.1 illustrates the characteristics of the participants interviewed and method of interview.

Table 5.1 Characteristics of participants interviewed. T: telephone interview. F: face to face interview

P #	Gender	Age	Referral reason	Referral source	Reasons for inactivity	Levels of PA/Activities pre-ERS	Dropout point
1 (F)	Female	44	Weight loss	Nurse	Previous fall	Nil	4 weeks
2 (T)	Male	51	Blood pressure/Cholesterol	GP		Squash/Rugby x2-3 per week	
3 (T)	Male	18	CV fitness for heart condition	Consultant		Volleyball	4.5-5 weeks
4 (T)	Female	37	Weight loss for Low back pain	Physiotherapist	Lack of time	Nil	
5 (T)	Male	53	Blood pressure/Cholesterol	GP	Work/previous injury	Walking Dog x 2-3 per week	Before 6 weeks
6 (T)	Female	50	Weight loss/Blood pressure/Cholestero	Nurse		Walking Dog x 2-3 per week	2 weeks
7 (T)	Female	54	Weight loss	Nurse		Nil	3 sessions
8 (T)	Female	32	Weight loss	GP		Nil	2 sessions
9 (T)	Female	45	Mental health	GP		Nil	0 sessions
10 (T)	Male	54	Blood pressure	GP		Walking/working each day	
11 (T)	Female	45	Weight loss	Nurse Practitioner	Renal Cancer	Walking Dog	6 weeks

Despite using maximum variation sampling to recruit participants, male representation was limited, along with participants within the 18-24 and 25-34 age groups. Table 5.2 illustrates how recruitment matched the planned sampling.

Table 5.2 Breakdown of age and gender relating to planned maximum variation sampling.

Age group	Total	Males	Females
18-24	1	1	0
25-34	1	0	1
35-44	2	0	2
45-55	7	3	4
Total		4	7

11 interviews were completed, lasting up to 32 minutes in length, with a mean time of 21 minutes. Following the interview, all participants received a debrief sheet, containing a unique participant ID code and detailed information about the research, including contact details of the researcher and the university ethics officer. Debrief sheets were provided by hand following face to face interviews, or posted to the participants following telephone interviews. All participants received a free swimming pass worth £3.90 to be used within the council run pools as compensation for their time.

5.4.3 Interview guide

The interview guide (Box 5.1) was developed to provide structure to the interview, consistency through the series of interviews (Arthur *et al.*, 2014) and to ensure that the aims of the study could be met through appropriate questioning. The interview began with mapping questions, which are typically broad and open, to map out the key topics (Yeo *et al.*, 2014). As the interviews progressed, this provided the basis to use more probing questions to gain more breadth and depth into the participants' experiences. The structure of the guide was informed by Arthur *et al.* (2014) and was used as an aide-memoire, not a prescription, allowing for flexibility. As the interviews progressed, the phrasing and probing was developed, based upon the responses of the participants, and supported by field notes. As the interviews were transcribed by the researcher (MK) following their completion, this provided an opportunity to reflect upon each individual interview and re-examine the interview guide. This reflection provided the opportunity to develop the interview guide, by refining the questions, their ordering and phasing. Details of how the topic scheme developed over the course of the interviews is discussed in the reflexivity section below and Appendix 8. While planning the interview guide, it was anticipated that interviews would take no more than one hour, as depth in an interview typically requires this time to attain (Yeo *et al.*, 2014). The beginning of the interview was used to explore how participants had previously engaged and felt about exercise,

and the route into the ERS. The core section explored how they felt about the ERS, the reasons for dropout, what the barriers or facilitators to adherence were, and to gain depth within this area. This was the main focus of the interview, as the reasons for dropout have not been explored within the literature and has been identified as an area to be investigated (Eynon, O'Donnell and Williams, 2018). The wind down was used to investigate what they would do to improve the ERS.

Box 5.1 Interview guide

Arrival and introductions
Context setting
Introducing the research
Ensuring consent is maintained
Overview of interview

Beginning of interview
Background information regarding the participant
Previous exercise background
How the participant ended up in the scheme

Core section of interview
Feelings once referred
What was it like/feelings at the start of the scheme
Why did the participant stop attending the scheme, what was the reasons for and why
Why that specific time
What could/could anything have been done to maintain attendance
Could anything have been done before/at the start of the scheme to aid attendance- were these within the control of the participant, how did they feel and what did they think during the scheme and when deciding to stop attending and what did they feel like once they made the decision.
Self-efficacy

Wind-down of interview
Future suggestions
Summation
What happens next with data generated and debrief sheet

5.4.4 Equipment and audio recording

All interviews were audio recorded and stored using an Olympus digital voice recorder (model DS-40). Following each interview, data were transferred onto a USB stick that was kept locked within the office of the researcher and on the researchers' secure university U: drive as per ethical agreement. The data were then deleted from the recorder. During phone interviews, the recorder was placed by the telephone, and the interview was conducted over speakerphone in a private office with only the researcher present.

5.4.5 Reflexivity

A reflection was undertaken following the first interview and telephone interview, to review how well the interview, including the content and order, were able to provide information supporting the research aims. The appropriateness of the questions, how they mapped and probed, supported by the field notes, were also considered, including the role of the researcher within the interview. Appendix 8 contains a reflexive account for the face to face and telephone interviews. It was concluded that the telephone interviews were not a barrier to communication and gaining depth. It was anticipated that follow-up questions would need to be more explicit due to the lack of nonverbal cues (Cachia and Millward, 2011). However, this proved not to be the case, as changes in tone or hesitation for example could be picked up during the telephone interview.

In both interviews, the main questions were covered and fulfilled the research aims. Some amendments to the interview guide occurred in response to the first two interviews, which highlighted some unexpected topics. These topics were: the participant's expectations of the ERS, if they had any follow-up following dropout, and their views on why under 55 year olds were more likely to dropout. Discussing barriers explicitly, was not included into the topic scheme as this appeared to emerge as the interviews developed. Topics regarding education and pamphlets were later evolved, due to the positivity of this in the first interview.

5.4.6 Data Analysis

Analysis of the interviews was managed using the NVivo (Version 11, QSR International) Qualitative Data Analysis software package. All data generated within this study was analysed using Framework analysis (Gale *et al.*, 2013).

Transcription

All audio recordings were transcribed verbatim by the researcher. Any data risking the anonymity of participants or health professionals were not transcribed and were removed. Transcription was conducted at the first opportunity following interviews in order to support recall. Field notes supported transcription and facilitated interview guide refinement for future interviews.

Following the initial transcription of each script, the transcription was cross-referenced with the audio data. This supported the accuracy of the transcription and

the familiarisation process. During transcription, details regarding interruptions, laughter, long pauses and references to field notes regarding gestures or pointing (i.e. point out location pain), where possible, were included within the transcription.

Familiarisation

The familiarisation process is a vital stage of interpretation (Gale *et al.*, 2013). It allows an overview of the interview content, helps identify reoccurring themes, ideas, and topics, while highlighting what participants are saying which is relevant to the research question (Ritchie and Lewis, 2003; Spencer *et al.*, 2014). Familiarisation started during the transcription and cross-referencing with audio data. Following this, each script was read by the researcher twice. During this, recurrent themes found within the data were noted. Recurrent themes were placed into an electronic spreadsheet, to build upon during each reading of the script, for each participant. Patterns and discrepancies between participants were noted, including, but not limited to topics such as gender, previous exercise habits/activities, reasons for referral, positive or negative views of the ERS, and suggestions to improve the scheme (See table 5.1). The topics developed during the familiarisation, were checked against the working interview guide to ensure that the process was comprehensive enough to cover the objectives of the research, and ensure the relevance of each topic point in the familiarisation process (Spencer *et al.*, 2014).

Coding

Interviews 1 to 4 were coded initially. Each line of each script was read, and where appropriate, assigned a label or paraphrase, each of which was considered as an individual code. Framework analysis coding can be considered as open, closed or mixed. Open coding involves unrestricted coding, whereby anything could potentially be coded, whereas closed coding uses pre-selected or defined codes based specifically upon previous literature or the research question (Gale *et al.*, 2013). Mixed coding was utilised in order to allow the exploration of specific issues, but also allow for the discovery of unexpected experiences, views or meanings to phenomena (Gale *et al.*, 2013). A coding diary supported this process. This provided an aide memoir to re-familiarise the researcher with codes previously used. Following the coding of interviews 1-4, the coding diary was utilised to consider how well the interview guide supported the aims of the study. The most commonly cited codes contained “suggestions to improve the scheme”, “reason for dropout”,

"miscommunication/lack of communication", "missed education opportunity" and "positives of the scheme". On review of the commonly cited codes, the interview guide and interviews were effective in gathering information congruent with the research aims.

Developing a working analytical framework

The first four scripts coded by MK were also independently coded by a supervisor (JN), without being privy to coding by MK. This process followed Gale *et al.* (2013), and provides the benefits of multiple coding, where there is independent verification of analysis (Meyrick, 2006), refinement of codes (Barbour, 2001) and provides peer scrutiny to improve trustworthiness (Shenton, 2004).

MK and JN convened for a "coding workshop". The codes generated by each researcher were discussed, compared and refined. The codes were also discussed in context of the key research aims. An observation from the workshop was the greater detail JN provided describing each code, while making more explicit links to the research aims. The coding workshop concluded with agreement on the codes and their broad meanings. Following the coding workshop, MK reviewed the detail of the codes used within all the interviews (#1-4) and applied the agreed codes from the workshop to the transcripts and then the remaining seven scripts.

The final stage of developing the analytical framework involved reviewing, refining and defining the codes. Each set of verbatim data text within each code was reviewed to assess its appropriateness to the code it was assigned. Data deemed inappropriate (i.e. if an extra line of text had erroneously been highlighted in NVivo and included with the code) was removed and this process was logged into the coding diary for auditing purposes. Any coded data deemed more appropriate for another code was transferred accordingly. This process uncovered examples of codes essentially describing a very similar theme, resulting in the codes being merged. If codes and their data text appeared similar, but upon inspection were deemed to be distinctive, both codes remained. The name of each code was reviewed to ensure it was appropriate, and a brief definition for each was provided. During this process, it was apparent that multiple codes were conceptually related, and could be grouped together into categories. The most apparent categories all linked to the key research aims of the study. However, as mixed coding (not closed) was employed, other categories were also identified, resulting in an additional

eleven categories. The codes and categories developed during this process are provided within Appendix 9.

Applying the analytical framework

Applying the analytical framework was aided by NVivo. The "coding" and "developing the analytical framework" processes involved electronically tagging sections of text within NVivo, while refining the codes and the text included with each code was also conducted using NVivo. Therefore, in practice, the framework was applied in "real time" during "coding" and "developing the analytical framework" stages. This illustrates how framework analysis does not consist of mutually exclusive stages of analysis, but is an interplay between analysis and theory development (Gale *et al.*, 2013).

Charting data into framework matrix

Due to the voluminous data and codes generated from the interviews, meaningful charting into one matrix was not possible. Therefore, each category was charted into a framework matrix. Transferring each matrix from NVivo into an excel spreadsheet improved visualisation, and enabled cross-referencing against each participant. Following Gale *et al.* (2013), each verbatim dataset was summarised, reducing the volume of data, but retaining the original views of the participants. Key quotes or statements made by participants were highlighted in bold for each column.

Interpreting the data

Each developed category was reviewed to consider what connections were present with, and between the research aims. The categories linked directly to the research aims, and the emergent themes were reviewed, and were developed into overall themes, which explained the data, and ultimately supported the research aims. To support this process, an analytical memo was developed. The memo contained notes on the categories, codes, raw data and deviant cases to support summarising the findings. MK and JN conducted a workshop to review the categories and themes. As the interpretation progressed, it became clear that many of the additional/emergent categories were not overarching/higher order themes, but rather provided detail, context and explanations to the categories generated from the research aims. While interpreting the data, and developing themes from the categories, further detail within the data was picked up, and explains why some

categories did not always map under a theme. To illustrate this point, the category "understand why participants dropout of the scheme" was rich in detail, and was explored to reveal information about limited time, which was a reason for dropout, but also a barrier to adherence. Diagram 5.1 indicates the categories developed and the three emergent themes following interpretation.

5.5 Findings

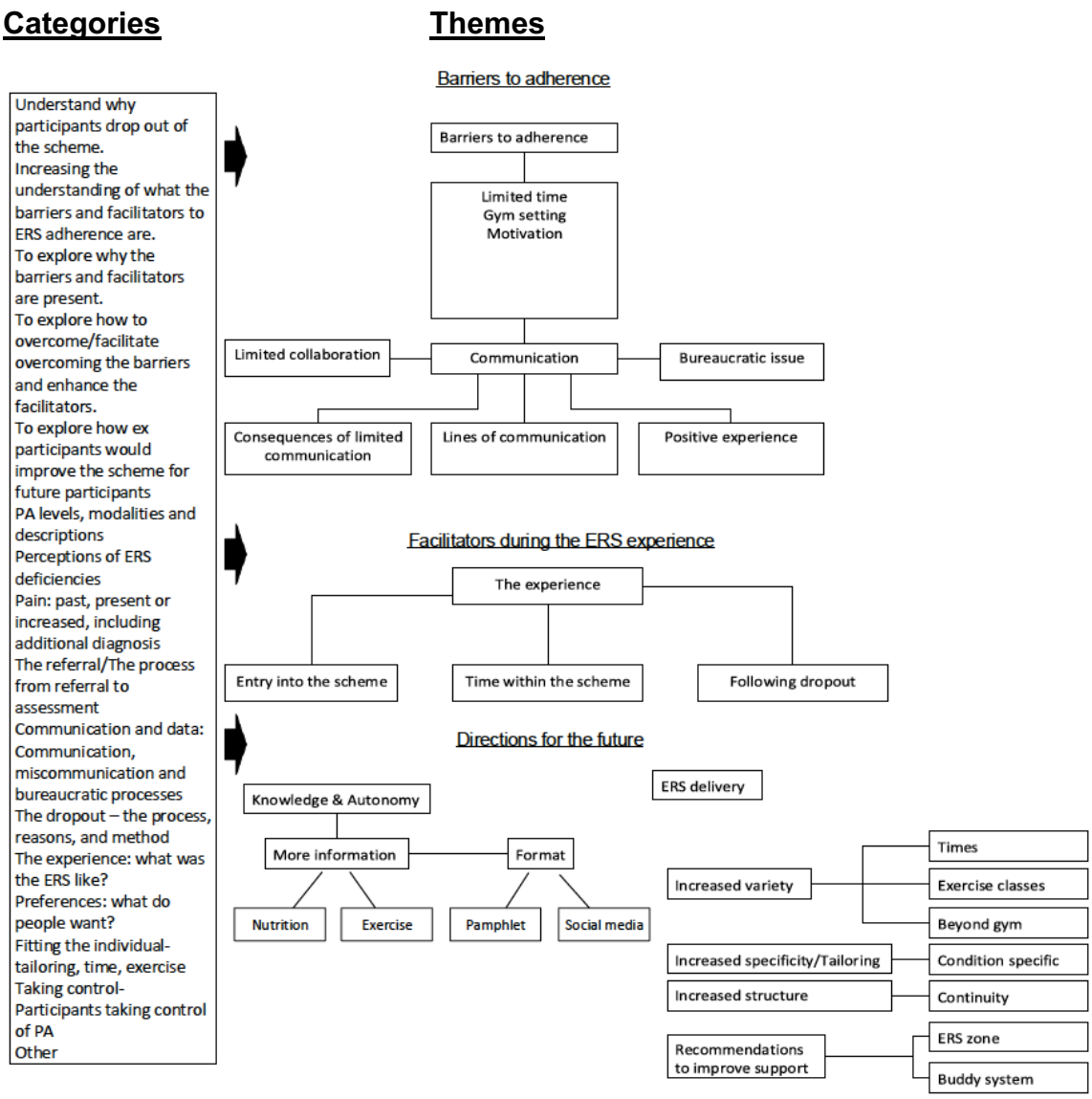
Three overarching themes were identified in the analysis, namely "Barriers to adherence", "Facilitators during the ERS experience" and "Directions for the future". During the interviews, participants were asked why they specifically dropped out of the scheme. While participants reported clear reasons for dropping out, the expansion upon these reasons was often limited and succinct, therefore not considered as a theme. The reasons for dropout are cited in table 5.3.

Most participants described having very limited levels of PA prior to starting the ERS. Some recognised this as being problematic, as they made the link between limited PA, and physical or physiological issues that were affecting them. Participants recognised that they had put on weight, had increased blood pressure or physical limitations, or in one case had a heart attack. Participants had a range of expectations on entry into the ERS. Many were linked to reducing weight, a reduction in blood pressure, supporting employment or increasing their levels of stamina/fitness. Some had specific expectations of how they would do that, often through swimming, as opposed to attending the gym. Each of the three themes will be discussed within the following sections, with each theme provided an individual section.

Table 5.3 Explicit dropout reasons

Participant	Explicit dropout reason
1	Not listened to
2	Time-work
3	Time-College
4	Pain/Time-Children
5	Time-Work/Grandchildren
6	ERS "Not for her"
7	Issue with gym
8	Time-Childcare
9	Price
10	Medication-Health
11	Pain

Diagram 5.1 Categories of codes and identified overarching themes



5.5.1 Barriers to adherence

Two subthemes were identified during the exploration of why participants dropped out of the scheme, or when barriers were being discussed (see figure 5.1). These were barriers to adherence and communication. The barriers to adherence subtheme, covers issues that made adherence more difficult but were not necessarily cited as the reason for dropping out. Barring one case, the reason for dropout cited did not have a link to barriers to adherence. In most cases, participants discussed multiple barriers that they faced, but did not cite these, or link them as clear reasons for dropout as cited in table 5.3. Following the analysis, it was clear that these barriers contributed to the participants' overall experience of the scheme. The second subtheme, communication, relates to participants describing a breakdown of, or suboptimal communication, such as being unable to contact ERS staff or the perception they were not being listened to. Communication issues were

linked or implicated with barriers to adherence, such as being provided gym exercises that were perceived to be inappropriate. To provide a logical approach to describing the findings, communication will be described in a separate subtheme due the frequency it was discussed and its apparent importance.

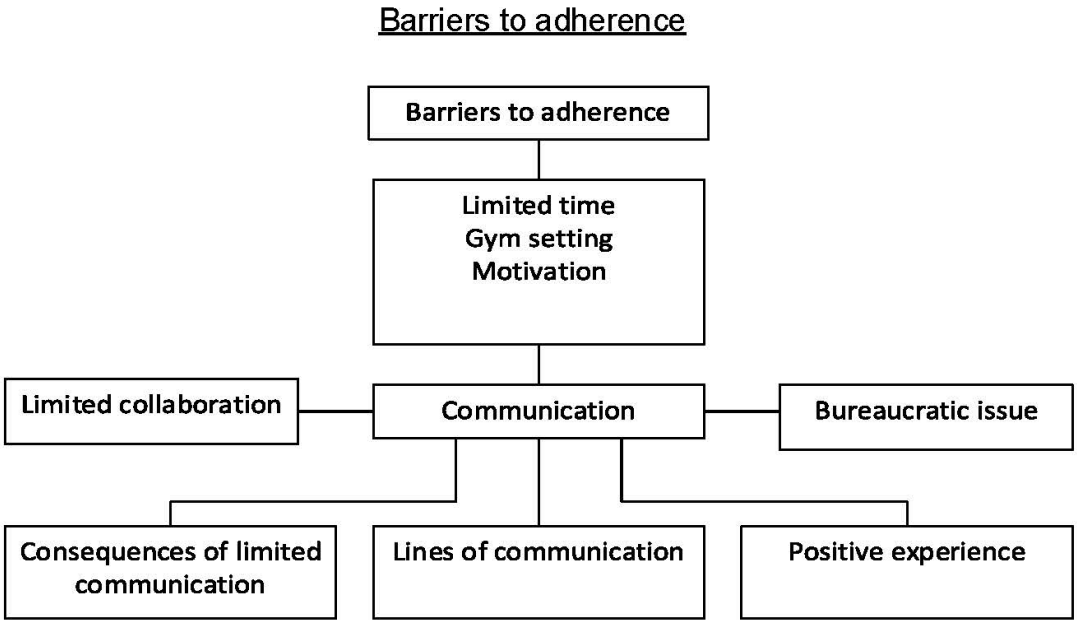


Figure 5.1 Identified barriers to adherence and communication subthemes

Barriers to adherence

During the interviews, participants were able to provide multiple examples of barriers to adherence which, although not explicitly stated as reasons for dropout, may be related to why they dropped out of the scheme. Limited time was discussed as a barrier to adherence in multiple cases, with responses similar to that below by participant 9. It should be noted however, that a lack of time was only verbalised as an actual dropout reason as well as a barrier by one participant (Participant 5):

> *P#9: I think cos, still, we have got young children, like, my twins are like 12. I think, over 50, your kids are up, so you have a bit more time on your hands. Whereas, like, for all im not working at the minute, I'm still quite busy*

The role of work friendly times, in terms of attending the ERS and attending the initial assessment was identified as an issue. Multiple participants perceived that the ERS was focused towards participants out of work, therefore the times available for those in work was limited:

> *P#1:There's nothing… to fit within work hours. There's… and it might be me being a bit of a … whatever… but to me you should be trying to keep people at work and catering slightly more for them…*

The ERS setting, and in particular the emphasis placed on the gym as the main

method of supporting PA was seen as problematic. Many participants reported feeling uncomfortable with the gym environment for a variety of reasons. The individualistic nature was a particular issue, whereby the fact that the exercises were carried out alone made them feel socially isolated, and this limited social interaction or peer encouragement:

> *P#1: The way you are, you still need a little bit of encouragement, and if you're not going to get it from the person at the gym, who are more focused on what they are doing, and you don't do things together, and you don't laugh… in a gym, if you did its very few and far in-between… there's no encouragement to go back*

Some participants, disliked the gym simply because they had no interest in it from the outset, some also reported a strong sense of feeling out of place in the gym, comparing themselves negatively to other users, in terms of fitness and feeling self-conscious as a result:

> *P#5: I've never ever been a person that can go to the gym, you know the… even when I was, training, the idea of going on a treadmill, just… filled me with, foreboding. Because it's just so boring, and, you know this, there all the issues of well, when your, you're not at your fittest, you feel self-conscious about going to the gym anyway.*

The gym equipment in particular was a source of concern, with participants feeling that the equipment was too much, too heavy, or not suited for them. Even participants who usually felt comfortable exercising in the presence of others, found that trying to use the equipment made them feel self-conscious:

> *P#4: But I did absolutely love the Zumba, but that doesn't bother us being in a class full of people then. But being on machine equipment really, really kind of did.*

It was clear from the interviews, that assuming all participants are comfortable engaging with the gym equipment is naive, and for some, is a significant barrier. Participant 7 had already described feeling that the equipment was not suited for her, but later in the interview, indicated how strongly she felt the equipment was a barrier for her:

> *I just think that the actual, equipment isn't for me. You know, it just never ever has been. I've never been intimidated by going in and, like or anything. It's never been anything like that. It's just the actual equipment in the gym, I just think "oh no", I couldn't be bothered*

Some participants felt uncomfortable in the gym, due to the presence of other people. This could be other scheme participants, or other members of the gym using the facilities. Exercising in front of other people was a barrier, due to the number of

people present, but also was an issue for some, who compared themselves and their body shape to other users:

> *P#8: yea and, like, I dunno, I just felt, like uncomfortable going because, because of "skinny mini's" and that…like at the gym and that*

A reliance on the gym as the main mode of exercise was also discussed as a barrier. There was a recognition that the scheme was orientated around the gym and lacked variety to support fitness improvement. While for some, the gym provided a sense of foreboding, for others the lack of variety meant that attendance was seen as boring:

> *P#1: don't just limit it to trying a gym first. Then being offered swim… because… one: the gym is as…. Boring…as hell. Regardless if whether you go with somebody it's still… you've got to be… a certain type of person… to… want to go*

While the gym and the gym equipment were barriers, participants also discussed how personal motivation, or the lack of it was a barrier to attendance. Although participants' did not often expand on the reasons for their lack of motivation, they could be forthright in stating that they lacked motivation:

> *P#2: I think it's just down to personally not being able to, couldn't be arsed to go basically.*

Participant 5 talked about being "comfortable" and it is possible that younger participants have not yet begun to worry about health-related concerns that are associated with older age:

> *P#5: I would say that's probably right. I would say that, I mean for me personally, from you know, from my 40's, I have been quite comfortable. And I thought, you know what it is… I don't need to go out running every night. I don't need to do all of this. Yes I know I could do with losing weight but, you know life is too short. You know, it can be taken, you have got to enjoy life. I mean I do enjoy exercise… don't get me wrong, it's just, I found that, I was quite comfortable just not doing anything you know*

Communication

Issues regarding communication were highlighted and discussed by the majority of participants. In almost all cases, the participant's discussion relating to communication was negative. The issue of communication was raised in many guises throughout the interviews. How and why communication was an issue, and how the issue manifested itself differed between participants. Communication as a theme encompassed five subthemes including; limited collaboration, the consequences of limited communication, lines of communication, positive

communication and bureaucratic issues. In some instances, participants described a combination of the subthemes being issues present in their individual experiences of the ERS, however this was not always the case.

-Limited collaboration

There was a recognition that communication issues could often start at the initial assessment. Some felt that the exercise programme was not tailored to them as individuals, in terms of the assessment itself, the resulting exercise plans or goals that were set, or in the modes of exercise that were offered. Participants often reported having quite specific goals, aims or preferred modalities of exercises that they entered into the ERS with. However, they reported that in various instances, they did not feel that the assessment was a collaborative process. They felt that they were not listened to, and this resulted in being provided with an exercise programme that was not satisfactory for them. Participant #11 elaborated how she felt that the assessment was a process, therefore resulted in a programme that was not tailored to her:

> *I felt it was just a ticky box exercise. "This has got to be filled in for you to do anything. But I'm not listening to what you say, it just means I have done my job cos I filled the paperwork in…"*
> *…no, I didn't feel like she listened to, to me, sort of my capabilities and what I wasn't going to struggle with. It was just, this is what I do, this is the programme, its one size fits all…*
> *...yea. Cos one size doesn't fit all.*

Linking back to the experience of participant 1, who had coccygeal pain, her expectations of the ERS were to be able to swim, to exercise without impact, to avoid exacerbating her pain, and had explained this to the exercise professional at her initial assessment. However, following the experience of using the bike which significantly exacerbated her symptoms, she discussed this with the exercise professionals who eventually, despite gaining different messages from the staff, offered her the opportunity to swim. This lack of consistency in communication, whether or not she could go swimming as part of the ERS, was a source of frustration for the participant. Later in the interview, her experience of the initial assessment was discussed, which highlights a lack of communication and collaboration. This experience also mirrors the initial assessment described by participants #11 and #6, both of which described a lack of collaboration in terms of goal setting. Participant 11 attended the ERS with clear goals and aims, however ended up being offered something that she did not want, which highlighted the lack of communication at the initial assessment:

P#11: The girl that did it, she was very negative. She wanted me to go to the dieting class, the health… the healthy eating advice class. And I explained to her, that I had lost 3 stone over the past year on my own, I knew exactly what should and shouldn't eat, it was more exercise. And she was just really negative, that I didn't want to do that and said well, I was pretty much wasting my time, but should give it a go anyway.

-Consequences of limited communication

Limited communication, or issues with communication, appeared to be a factor in exacerbating participants' pain, when the participant had been referred for, or with pain and/or an injury prior to starting the scheme. This often proved to be a significant factor towards dropping out of the scheme. Participants reported that they did not feel they were listened to, and for some this resulted in exacerbating their pain by doing the exercises that were not tailored to them:

P#1: well, a broke me coccyx. So what did they tell is to do? Go and sit on a bike…. I'm in hell. … each week was getting progressively worse…
…a can't do it… a told you what the problem was… a felt like they had prescribed everything that I couldn't do…not anything that I WOULD be able to do. So a rang up and said "I'm coming off the scheme"

P#11: But I explained about the rotator cuff problem in my shoulder, and having, I still have pain with that, so I didn't really want to do anything where I was pulling a lot on my upper arms or my shoulders. But she didn't really listen to that…
I felt like she didn't listen, or take on board anything I said…
…and then only went to the gym maybe 3 or 4 times because, I was trying to do what she said, it was really painful in my shoulder and it wasn't worth it.

-Lines of communication

Communication issues appeared to be bidirectional, not only exercise professional to participant, but also from participant to exercise professional. Following a referral for low back pain, participant 4 experienced an exacerbation of her symptoms following the gym induction. The pain put her off attending, and when she was asked if she had reported the problem to the staff, she recognised that she should have, but simply did not go back. Not being able to contact and work with the same member of staff for support, was also cited as an issue, resulting in a lack of continuity. Some participants described difficulties relating to this, with participant one feeling frustrated that she had to explain her problems to multiple members of staff instead of just one. Some participants discussed how they felt unaware of, or there was limited communication regarding what the ERS may entail in terms of time commitments, and if this had been communicated more clearly, it would have been beneficial. While issues with the gym equipment have been highlighted as a barrier,

the communication regarding the operation of the equipment was also problematic, with limited guidance on how to use the equipment:

> *P#8: I duuno cos, she didn't… she just told is what machines and that would go. And like told is on the machines what to do and I was left to me own, left to me own device…*
> *P#8: I could have done with more support, because just showing once what to do on all of these different machines,*
> *…it's a lot to take in*.

-Positive experiences

Not all participants experienced issues with communication. Some had positive experiences, describing the professionals they dealt with as available for discussion, and good at communicating. Positive communication was described during the assessment and during the scheme itself. Participant 10 described how thorough and detailed communication during the assessment process highlighted a medical concern, which could otherwise have been missed. Participant 7 also favourably described the communication skills of the staff member she worked with, and highlighted how communication led to trust between the participants and staff:

> *P#7: She was like, really good at what she was telling you and what you knew, it was really in your own head, you were thinking… whatever she is telling you- its right, what she was telling you…*

-Bureaucratic issue

Although not a theme regarding dropout reasons or barriers to adherence, an issue regarding bureaucracy was uncovered within the interviews. On a bureaucratic level, a lack of communication resulted in delayed assessment, or as highlighted in one case, partly explained why a participant appeared to have dropped out of the ERS. Participant 2 had dropped out, and was recorded within the ERS database as dropping out. However, he explained in the interview, he was about to restart the ERS, which was not recorded in the ERS database. This suggested that it was not possible for the ERS to keep track of all participants, and may not be an isolated incident- which may impact on the accuracy of dropout and uptake data for the ERS. One participant also reported a one year wait before being contacted to start the ERS, and although not a factor in dropout, could clearly be an issue for other participants.

5.5.2 Facilitators during the ERS experience

Through the course of the interviews, participants described a range of experiences regarding the ERS. A significant portion of the data is described within the themes

"Barriers to adherence" and "Directions for the future", both of which heavily relate to the research aims. This theme, "Facilitators during the ERS experience" includes three subthemes that represent three phases, namely "entry into the scheme", "time within the scheme" and the participants "following dropout" (see figure 5.2). Within this theme and its subthemes, data relates directly to one key research aim, namely, understanding what the facilitators to ERS adherence are, and how to enhance the facilitators.

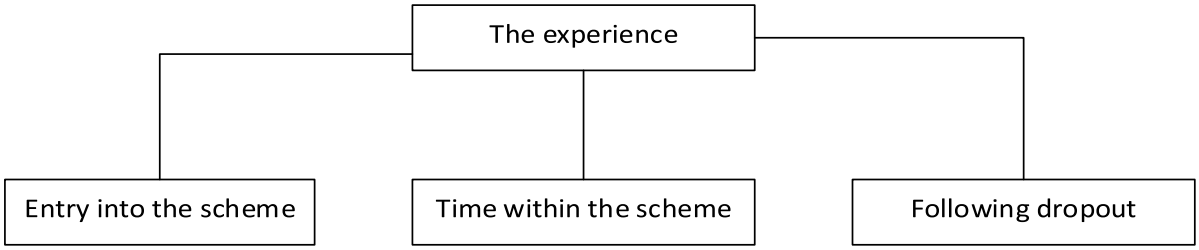


Figure 5.2 Subthemes within the experience of the ERS

The experience

Participants identified or described a range of topics that were generally considered as being positive, many of which were described explicitly as facilitating attendance to the ERS. Despite none of the participants achieving full adherence, the facilitators they described were seen as helpful to minimise the impact of barriers. Some of the topics described by the participants were implicit facilitators, therefore not described explicitly, but interpreted as a facilitator. Some data taken in isolation with each participant was not illustrative, however, when taken in the context of interviews together, clearly described facilitation. For example, the sources of referral were wide ranging, which provides more opportunities for attendance, or at least uptake. The key facilitators identified by the participants included: referral time/process, a range of referral sources and supervision/support (personal and financial). The majority of the facilitators were situated within the "entry into the scheme" subtheme.

Entry into the scheme

The time taken for a referral into the ERS was commented on in positive terms, in almost all cases, even by participants that were on the whole, quite negative about the ERS. Participants often were able to start the ERS very quickly, ranging from a few weeks, to days of the referral, which was seen as an easy process in itself. In most cases, participants at least were satisfied with the referral process and time.

Although participants were not in position to know, or comment on the range of referral sources to the ERS, the data collected highlighted that a range of entry points to the ERS were utilised. Removing the concept of having only one point of entry or source, means that the process into the ERS is more streamlined, requires minimal effort on behalf of the referrer (and the participant), and can be considered at least, as a way of overcoming barriers, if it is not in itself considered as a clear facilitator of adherence.

Not all of the participants described a satisfactory referral time or process. Participant 3 reported that his referral took over "a year and a half". Participant 10 highlighted the negative impact of a prolonged referral time "so I was 3 months…with having the heart attack as well, I got a bit depressed about it as well". Although the reason for a delayed referral and start of the ERS for Participant 10, was due to clear and justifiable medical reasons, and a heart attack impacting on the participant's mood, it was clear that the delayed start itself was having a significant effect on the participant.

The financial savings provided by the ERS was commented upon, not only itself as a benefit, but also because this increased accessibility:

> *P#11: the costing was excellent… at such a reduced cost that was excellent that meant it was really accessible and affordable*

Subsidised exercise was a clear facilitator for participant 2. He was aware that he had elevated blood pressure, and therefore would be eligble for discounted gym attendance and requested a referral from his GP.

Time within the scheme

Participants described a range of positives during their time within the scheme. Some participants commented favourably on the detailed assessment and praised the quality of the gym facilities. However, the main topic related to the ERS staff. The staff were seen as facilitators in various instances, in terms of motivation and support, as well as allowing the participants to feel safe when they attended. Participant 10 highlighted the approachability of the staff, their ability to motivate, and especially in this participant's case, effectively screen for significant health concerns:

> *P#10…but, they have found out that I had high blood pressure, so I mean that could have been, I could have been exercising and bloody keeled owa (die). You know what I mean?*

…so really they… part of that monitoring system, did help me in my case, and they've stopped is…
…maybes having another episode, or something you know.

Although all of the participants ultimately dropped out, the staff were seen as facilitators, because they provided motivation, encouragement and support. This could be in the form of being approachable, or making participants feel comfortable to ask for advice. For example, being able to simply knock on the door of the scheme's main hub and ask for advice, helped facilitate a recognition about the knowledge and skills the ERS staff had, while providing motivation and increasing the levels of trust in the staff:

P#4: … just kind of listened, cos, I thought, you know the lady was a professional. She knew what she, she was talking about. I didn't really know anything, so I just, listened to her advice. Took on board, just, were going to try and get is built up with the exercise

From a motivational aspect, the staff were described as being very helpful in terms of providing encouragement. Being able to provide effective encouragement was also recognised as a facilitator, and supported the level of trust the participant had with the staff member:

P#7: Like she had a list of things that I could have like tried, she was really really good. And she was really really like, she was good because she was like pushing you a little bit more and pushing you that little bit more, she went, you can do whatever you want to do"

Participants also recognised that the ERS provided an opportunity to facilitate PA, either by facilitating access with reduced pricing, or providing a starting point to exercise from. Despite some of the problems that participants faced when starting, or being within the scheme, the concept of it as a whole, was seen as a facilitator to exercise:

P#5: I think as a whole, the whole scheme is absolutely fantastic. The idea, that somebody can start getting into exercise, who maybe hasn't had that opportunity. Cos sometimes, I mean, you know, leisure centres, they can be quite expensive you know. And having that reduced, sort of, fee, gives you that base to start of which might just get you hooked on the exercise…for you to then carry on.

Following dropout

While all of the participants within this phase of the study had dropped out of the scheme, they did describe benefits of at least starting the scheme. A key aim of ERS is to support and increase PA, and/or reduce weight. Despite dropping out, a range of participants reported that they had lost weight, or felt the scheme facilitated an

increase in PA. They described how the experience motivated them to do more, or used the information they learned by attending the scheme to help increase their activity or reduce their weight. While participant 1 was not satisfied with her experience on the whole, she was able to turn the experience into a positive for her. Following dropout, she managed to increase her PA levels by trying a range of different exercises classes and as a result was consistently more active. She attributed this change to the scheme because:

> *P#1: And I think it give is the…kick up the backside …I needed to go and at least do something… and that made is join aquafit.*

This was not an isolated case, participant 7 also described how her experience within the scheme provided her with a "push" to become more active by trying different activities, and pushed her more than she would have done without the experience of the scheme. Other participants described how they managed to increase their PA, using what they had learned during their time in the gym, by using the programmes they had been provided. Participant 3 described how he kept using the exercise programme he had been provided, and saw a non-specified improvement during a hospital follow-up assessment, which had been interspersed by his time in the scheme. Additionally, he described how he was now able to look for more opportunities to be physically active, which was a view shared by other participants, who had been able to lose weight by incorporating activities such as a walking the dog.

5.5.3 Directions for the future

During the interviews, participants provided a range of suggestions to improve the scheme. Two broad subthemes were identified from this, the first relating to knowledge and autonomy, and how this could be achieved. The second subtheme related to how the scheme was delivered, and how this could be improved. Often, the directions for the future were provided in response to the barriers or issues that they had faced during their experience of the scheme. Figure 5.3 summarises the subthemes identified within this theme.

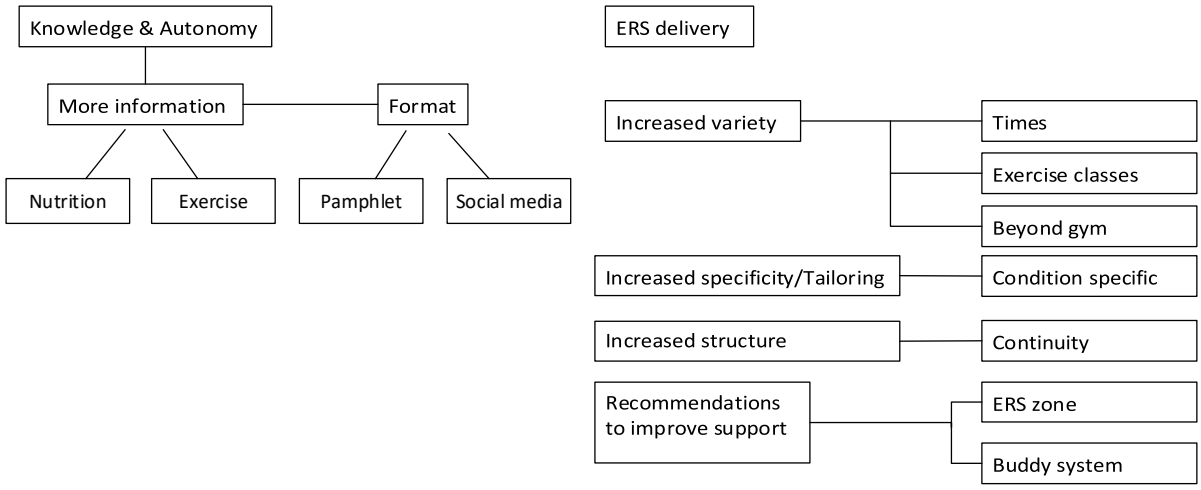


Figure 5.3 Subthemes identified from "directions for the future" theme

Knowledge and autonomy

Participants frequently requested more information, with the aim of increasing the autonomy they had, so that they could be less reliant on others or the scheme, and be able to tailor their exercise to their own lives. How the participants requested the information to be provided also correlated with the notion of providing options to become more autonomous or move away from the gym environment.

More information: nutrition and exercise

Participants often discussed how they would have been interested in more support, particularly in the case of nutritional education, especially in the light that many of the participants were referred for being overweight. Some participants described wanting more nutritional support, or being interested in receiving it, but it was not made available to them. Gaining information to support a healthy life balance, by including healthy eating advice was also requested. It appeared that nutritional information was requested most commonly due to a lack of understanding about it in comparison to exercise:

> *… P#6: That's the only thing that the way I can describe it. It was not enough information regarding, you know, healthy eating. There wasn't enough information regarding sort of the gym, just not enough information. I came away and I just thought, well, what was the point?*
> *… P#6: And I certainly, a big plus to me would have been, as a little bit more information of healthy eating.*

There was a recognition that the internet could be used to find nutritional information. However, it was not necessarily seen as a trustworthy or reliable source of

information. Example meal plans, especially advice on how to develop a weekly meal plan was viewed as a gap that could be filled with education within or by the scheme.

Requests for more exercise information revolved around how to change training sessions, to make the most of limited time, and fit around schedules. For some participants, they requested more information on both nutrition and exercise, particularly how to balance both to complement each other:

> *P#3: just like the guidance and kind of like, say like, they could say, ah, you know, these are the sort of things you should be doing, this is sorta the, like lifestyle changes that are happening, so that you kinda, so you can balance it out, like, health side, like tha fitness, and kinda looking at the food that they eat, and kinda balancing the two out.*

Participants made suggestions to improve the scheme by being able to exercise away from the gym, and in particular were also keen to gain more information about exercise they could do at home, to fit more effectively with available time:

> *P#6: if I couldn't sort of make it to a gym, or something like that, then tell is… you know what exercises I was going to do, and hopefully try and build around my time, and to sort of fit me into this, to a gym session…*
> *… P#6: so, structuring things that would help me in that way… so, even say, if she couldn't have getting is to the gym, because I was too late… I don't know, right say, you know, if it was me, I would say "fair enough, you know, you were… it's a struggle this week, or maybe next week, to get to the gym, but… try these little exercises at home and that"*

Formats of providing information

Participants discussed methods of providing information to support the scheme, alluding to having information to take away, and something that was tangible to help support themselves beyond the ERS. One participant described how being provided home exercises by a Physiotherapist had been useful, because she could quickly carry them out when she had 10-15 minutes free and could be useful for the scheme. In most instances, discussion revolved around a pamphlet or information pack to provide educational information. The benefits of this related to having something that could be used as a reference and provide an opportunity for the participants to absorb the information they had been provided. Additionally, having a source of information meant that participants could have a range of options, in terms of meals/diets or exercise to choose from. Participant 6 provides an overview of the benefits and rationale for providing a pamphlet:

> *I: your more wanting to get the tools to be able to look after yourself, as opposed to relying on somebody else?*

P#6: well, that's it. I mean, at the end of the day, everybody sort likes to, to, to go in and, you know, have somebody to bounce different things off. They are not with you 24/7, so, I feel as though, having a little bit more, I don't know… more, more structure, more you know, detailed pamphlets… you know different ideas in, maybe, you know a little bit more with the exercise… …But I think, that they should be more maybe pamphlets or something, telling you little short exercises that you can do. If you can reach to the gym. And I certainly, a big plus to me would have been, as a little bit more information of healthy eating. And, maybe a week of an example planner, of how to put things together well.

Social media was also suggested as an option to provide information and support. The concept of a buddy system was also suggested to provide peer support for other participants.

Delivery of the ERS.

Participants' discussion revolved around four main points in terms of delivery of the ERS: Variety, specificity/tailoring (to the individual), structure, and general ERS suggestions to support the participants' experience.

Variety

Participants often discussed a need to increase the variety that the ERS offered. This was in terms of time slots available to exercise in, the variety of classes that were offered, and variety beyond exercising in the gym. In terms of time slots, perhaps not surprising based on previous discussion, suggestions focused on increasing the number of evening assessments, or generally providing more opportunities beyond normal working hours.

Participants also suggested having more opportunity for variety e.g. including dance classes such as Zumba. At the conclusion of her interview, (unfortunately when the recoding was switched off), P#1 suggested that the scheme could offer taster sessions for people to try different exercises, with added social benefits. Some, like Participant 7, mentioned including classes more tailored to a younger age group:

P#7: yea, I would have said yes, if they had different classes for different…. Like I say, if they had like a dance class, or, a thingy class where you all… but this was, like I say it was just, seemed to be a bit too old. Like if they had younger class and a different… day or whatever. Or a different time, you would think "ah well, that's fair enough".

Increasing the variety of the training built into the gym programmes was also suggested, in terms of being able to target different types of fitness and keep each week different:

> *P#3: And the thing that I think could have improved it, if she had done it like one week say, are, coming in do a bit of gym work, then next week will do some swimming and then like, so added a bit variety to the way I improve my fitness…*

Specificity/tailoring

Suggestions to improve the scheme were also discussed to improve the tailoring of the scheme to fit the individual. Providing the ability to make aspects of the scheme fit a participant's lifestyle and personal needs were cited as ways to increase the tailoring offered. Participants also recognised the value of having condition specific classes or support, for example, for mental health conditions, both for specialised exercise and for social bonding with others in a similar situation on the scheme:

> *…P#9: I think, I know, it's nothing to you's, but it is for someone with mental health, whether it be depression, bipolar or anything… sometimes you cannit physical make yourself come out of the house, so if you miss 2 you are struck off. It's, I think, it goes down… it should go down to the individual person, like what they suffer with.*

Structure and continuity

Structure was directly and indirectly discussed by participants in relation to improving the ERS. Structure related to how the assessment or exercise was provided, how advice was given, and how staff were allocated and contacted by participants. A lack of continuity regarding staff availability to provide support when it was required, was discussed as an issue and linked to communication. Participants suggested having a telephone contact number for the specific member of staff assigned to them and clear indication of when they could ring. It was clear that continuity and structure was important for participants, and something that they felt could be improved within the scheme:

> *P#6: structure! That's the word I was looking for.*
> *P#6: I need a little bit more structure, that's what I needed, because obviously… time limit is just an hour or an hour and a half or whatever it is. Which is a very small amount of time, what I needed was maybe I could have worked on and worked to for the following week.*

Recommendations to improve support

Other suggestions to improve the ERS by the participants generally related to improving support. Improving the support participants had was discussed in various guises using different approaches. A common suggestion was via a buddy system,

or an area of the gym specific for ERS participants. Aspects of this have already been alluded to in terms of using exercise classes to provide social support, but the following data relate directly to the suggestion of using a buddy system. Participant 8 reported using a buddy system in a previous experience, and felt that it could have helped in her most recent experience of the ERS, but wasn't offered the opportunity. The introduction of a buddy system was seen as a positive suggestion, to help promote motivation and peer support:

> *P#11: yea, I think buddying up would be good. Definitely because you motivate each other then. And when ones not feeling 100% like doing it, if you committed to go with somebody else, your more likely to do that*.

However, the introduction of a buddy system appeared to come with some caveats. The experiences of participant 7, who dropped out as she felt too young for the class she attended, suggest that social support was important, but tailoring was also valued. Therefore, using peer support, in this instance a buddy system, should be carefully considered before being implemented. Participant 9, who was an advocate of the buddy system, highlights that appropriate buddying up would be important:

> *I: so if you go in with somebody who was also in a similar situation, never been to the gym before, do you think, if you could tie people up in that way, that would have helped? And maybe made things a bit easier?*
> *P#9: if they, if they suffer with the same mental health issue, I would say [yes].*

Providing support beyond a buddy system was also discussed. Having support via phone/text messages was suggested, which appeared to serve for closer links between the participants and the scheme. It is interesting that this was suggested, as this highlights the lack of consistency and continuity individuals experienced during the scheme. Examples of limited continuity with communication has already been highlighted, and it appears for some participants they already used phone (using texts or calls) to communicate, whereas other participants do not appear to have, because in the case of participant 4, this was a suggestion made to improve the scheme:

> *P#4: maybes a couple of reminder calls, or something. Or some sort of contact afterwards. Just to kind of, push people along a bit really. I think it is easy if you're not into a habit of going, then you don't go, then, you're not in any sort of habit. So just somebody to go… "well you haven't been"… do you know what I mean, just.*
> *I: So there's the, like a closer link between yourself and the scheme?*
> *P#4: yea*

The inconsistent experiences regarding communication through text has already been discussed in the case of participant 11. However, despite a less than optimal

experience of this, the participant still felt that using text to support participants could have benefits to support adherence and communication, by providing an open and approachable line of communication if participants were struggling.

5.6 Discussion

This study aimed to understand why participants dropped out of the ERS, what barriers or facilitators were present, how to overcome the barriers, enhance the facilitators, and finally, explore how participants would improve the scheme. The study revealed a range of novel findings addressing these aims, in particular that communication, individualisation, autonomy, and the means to achieve or improve these were important for the participants.

Communication was implicated as a dropout reason and barrier to adherence by many participants, appearing to be a significant issue, and impacted on them in various ways. Participants felt that a lack of communication, or not being listened to, contributed to an increase in their pain/symptoms, as the exercise plans they had been provided were not suitable for them, on account of not being listened to by the staff. Pain as a barrier or reason for dropout has been rarely reported on. Hanson *et al.* (2019) described issues with an ERS dropout, who had difficulty coping with exercise sessions due to pain, and did not feel supported by the staff, while Morgan *et al.* (2016) described concerns with injury or an exacerbation of a condition, as potential barriers, but not reasons for dropout. However on inspection, some of the papers included in the review did report that pain was a reason for dropout in some cases (Lord and Green, 1995; Martin and Woolf-May, 1999; Taket, Crichton and Gauvin, 2006), however, pain was not linked to limited communication, as within this study.

Limited communication also resulted in untailored, poorly individualised or impersonal goals, viewed by participants as a “one size doesn’t fit all” approach. Individualisation has been cited as desirable for participants, which supports a tailored exercise plan linked to their needs, perceived ability, and their preferences (Morgan *et al.*, 2016). However, as previously mentioned, only the work by Martin and Woolf-May (1999) and Taket, Crichton and Gauvin (2006) included the views of dropouts. Rowley *et al.* (2018) reported that ERS are typically generic and not suited to individual participants or their disorders, supporting the findings of this current study. However, not all participants described a similar experience. Participants viewed the staff positively in most cases, regarding them as helpful,

knowledgeable and supportive. Pentecost and Taket (2011) and Birtwistle *et al.* (2018), have commented on the exercise professional being a facilitator when providing support, and a barrier when support was lacking. Pentecost and Taket (2011) reported that support was critical for uptake and adherence, whereas Birtwistle *et al.* (2018) linked support as a facilitator for uptake, and a lack of support viewed as a barrier for uptake.

Vinson and Parker (2012) have highlighted the value of staff availability and that an absence of staff, or a lack of motivation from staff was a barrier or demotivator. Morgan *et al.* (2016) also highlighting staff support and supervision as a facilitator, and conversely, a lack of as a barrier. Participants described difficulty contacting staff when requiring support, or difficulty contacting the same member of staff to maintain continuity. Hanson *et al.* (2019) highlighted issues with telephone support, where it was not successful in helping a participant attend, or, the calls were not answered and the lines of communication lost, mirroring an experience within this current study. A final issue relating to communication involved a participant stopping attendance, being recorded as a dropout, but at the time of the interview was about to re-start the ERS. This type of bureaucratic issue has been reported by Birtwistle *et al.* (2018), and on a wider perspective, highlights issues with dropout reporting across the literature, however, does not help explain why people dropout.

Within the theme of “directions for the future”, participants addressed the issues they had relating to communication, individualisation or a lack of autonomy, through suggestions to improve the scheme. Participants often requested more information. This included more nutritional or exercise information, such as meal planning or instructions to operate gym equipment, provided in a pamphlet. Participants expressed a desire to be able to exercise away from the gym and have the knowledge to exercise without reliance on the exercise professionals, so they could have more control, especially if gym attendance was not possible. Participants suggested improving communication with ERS staff by using a text, or email, which could serve as support, but also motivation. Tailoring not just for individuals, but for specific conditions was also suggested. For example, mental health, whereby participants may not always attend due to changes in their mental health status-having more tolerance towards being discharged from the service because of missed appointments was suggested. Tailoring has been seen as desirable in previous studies (Morgan *et al.*, 2016), however it does not appear specific to a condition, but more toward needs, ability and preference.

Martin and Woolf-May (1999) reported that both ERS adherers and dropouts had difficulty remembering how to use gym equipment, and concerns about how to exercise correctly. Martin and Woolf-May (1999) also reported that participants had been provided with information about exercise, which made them more confident about exercise. Interestingly, those who dropped out did not feel that they learned anything new with the information, which did not appear to be the case with the adherent participants. Eynon *et al.* (2019) highlighted findings by Hardcastle and Taylor (2005), reporting that adherent ERS participants experienced feelings of autonomy and control, supporting an ability to exercise on their own. Eynon *et al.* (2019) also identified studies by Fenton *et al.* (2015) and Eynon, O'Donnell and Williams (2018) which highlighted elements of choice and empowerment to support autonomy and control. However, these studies included older, or adherent ERS participants only. Therefore, the findings of this current study are unique, as no studies have specifically investigated ERS dropouts, meaning comparisons are not possible. There appears to be no literature regarding exactly what type of information ERS participants would like, how it should be provided, and in what format. This qualitative study has addressed these gaps, by highlighting the need for more nutritional and exercise information to be provided in a tangible format, for participants to take away and utilise in their own time.

A reason the participants within this study were recruited, was due to their age (under 55), as this group have been identified within the literature (Hanson *et al.*, 2013) and within chapter four (Kelly *et al.*, 2016a) as most likely to dropout. Some participants provided insight, explaining why this may be the case, highlighting issues including childcare and work. This finding is unique, as no qualitative research has investigated or reported on this, therefore making comparisons difficult. However, this finding does begin to explain why this group may have higher dropout, providing insight into the obstacles that needed to be overcome to facilitate adherence. During the expansive discussion, a lack of work friendly times that were made available, including the induction times for the ERS, were highlighted as issues. These have previously been cited by Birtwistle *et al.* (2018), with participants that failed to uptake to an ERS, citing an issue with the assessment times or issues with taking time off work to attend.

Beyond not feeling listened to, the reasons for dropout provided by the participants included a lack of time, pain, feeling the ERS was not appropriate for them, expense, medication issues and the gym setting itself. These reasons were discussed in

limited detail, typically not going beyond a relatively simple and explicit answer, therefore did not constitute a subtheme. In many cases, the participants discussed common threads that were interpreted during the data analysis stage as more problematic for the participants in terms of why they dropped out, and these often differed to the explicit reasons that they articulated for dropping out. Only one participant cited a reason for dropout, that matched the barriers to adherence that they discussed. It is not clear why this was the case. The participants may not have previously considered a specific answer to why they dropped out and provided their dropout reasons as a first response. There could have possibly been a lack of depth in the interviewing technique, or premature closure, an issue with undeveloped themes in qualitative research (Connelly and Peltzer, 2016), due to the limited experience of the researcher. In each instance, the more expansive discussion occurred later in the interview, after they had provided an explicit reason for dropout. This could possibly be due to the development of a rapport (Yeo *et al.*, 2014) or, because enough time had passed to bring the participant away from a superficial/surface level of interaction, towards a more focused level regarding the topic, meaning the participants reflected on the topic more than they had before (Yeo *et al.*, 2014). Possible explanations for the limited detail to the dropout reasons, and the increased detail provided by participants towards the end of the interviews, could be a combination of the aforementioned reasons, however it is not possible to know, but provides potential explanations for these occurrences.

Comparing the cited dropout reasons to the literature, Morgan *et al.* (2016) revealed a range of barriers to exercise within ERS, including issues with session times, cost, and an intimidating gym atmosphere. However, these were barriers, not specific reasons for dropout. Taket, Crichton and Gauvin (2006) reported that some participants within a diabetes specific ERS reported ongoing pain as a reason for dropout, as did Martin and Woolf-May (1999), which highlighted illness and injury as a reason for dropout. Issues with medication has not previously been cited as a barrier, although in this current study, the medication itself was secondary to an ongoing health issue, which has been cited as a reason for dropout by participants (Taket, Crichton and Gauvin, 2006; Hanson *et al.*, 2019). Cost has been implicated as an issue within ERS despite its relatively low cost of attending. Hanson *et al.* (2019) reported an example of a participant struggling to attend, despite recognising the attendance fee was relatively cheap, because he was on jobseekers' allowance. This experience was mirrored within this current study, where an unemployed participant reported the expense to be a dropout reason.

Where participants cited a dropout reason, but later discussed other issues in more detail have been highlighted. For example, some participants initially stated that time/childcare, feeling that the ERS was “not for them”, and expense were their reasons for dropping out. However, through interpretation of the interviews, the common threads identified relating to their reasons for dropout included not feeling comfortable in the gym or motivation- none of which were discussed explicitly as reasons for dropout.

A reliance on using the gym as the main method of exercise was criticised, as this limited variety. Participants often described feeling uncomfortable. This could relate to the gym, the equipment, other gym users, or being limited to the gym as the main mode of exercise. Martin and Woolf-May (1999) and Pentecost and Taket (2011) reported similar concerns with both ERS dropouts and adherers, as they initially found the gym environment, or other users appearances intimidating. Morgan *et al.* (2016) has reported issues with a lack of work friendly timing, and participants feeling uncomfortable attending a gym, or feeling that more variety was required. However, these findings are not based specifically on ERS dropouts, dropout reasons or those under the age of 55 years as this current study is. Therefore, this study provides new and valuable insight into a poorly understood and poorly represented group within ERS research, and provides clear suggestions to improve the scheme. Additionally, gaining information from a subgroup that represent the majority of ERS dropouts, or those with increased likelihood of dropout (dropouts within the first six weeks/younger participants under 55 years old), provides insight about how to improve the scheme for individuals most at risk of missing out on the benefits of successfully adhering.

Motivation has been investigated within various studies, including Morgan *et al.* (2016) and Eynon *et al.* (2019) with both quantitative and qualitative measures. Morgan *et al.* (2016) reported an inability to draw clear themes, but highlighted that some studies reported a lack of self-motivation was present in some participants. However, within the studies that reported a lack of self-motivation, only Martin and Woolf-May (1999) and Taket, Crichton and Gauvin (2006) included any data from ERS dropouts that were peer reviewed journal articles, as opposed to PhD thesis or foundation reports. Eynon *et al.* (2019) concluded that intrinsic motivation was associated with optimising adherence, but this was based on a lack of consensus with the examination or measurement of adherence, and as discussed earlier, data that was not drawn from ERS dropouts. Goal setting has also been associated with

motivation and successful adherence (Eynon, O'Donnell and Williams, 2018), this therefore could suggest that a lack of goal setting was problematic within this study.

Birtwistle *et al.* (2018) have described how participants did not uptake, despite acknowledging the perceived benefits of exercises, as they could not prioritise this over other commitments such as work or family. This was observed in multiple examples within this current study, where participants acknowledged potential benefits of attending and exercising, but could not prioritise this before family or work.

Other directions for the future revolved around the ERS delivery. Participants suggested increasing the variety of ERS delivery, through more attendance times, more modes of exercise or opportunities for activities such as Zumba. Using more classes to promote exercise was a popular suggestion, to provide support and motivation for participants. The notion of introducing a "buddy system" was also discussed and viewed as a way of promoting support between participants as a method of motivation. Eynon *et al.* (2019) identified multiple papers reporting the benefits of group exercise by ERS completers, which included social support, a sense of community, an incentive to attend, and provided a shared experience with other participants. The Morgan *et al.* (2016) review, containing papers based predominantly on the experiences of ERS completers, reported that participants found inconvenient times as being a barrier to attendance, while participants valued variety within the schemes, with some papers suggesting that participants had preferences for variety in the form of group exercise, swimming and Yoga, which mirrors some of the findings within this current study.

The facilitators during the ERS experience theme predominantly related to entry into the scheme. The time to gain a referral into the ERS was almost universally positive, with short waiting times ranging from days up to 4 weeks. Time to gaining a referral does not appear to have been investigated or discussed in the literature. The subsidised cost of attending was a facilitator for many participants, mirroring Birtwistle *et al.* (2018) where cost was an uptake facilitator. However, for one participant, the subsidised cost was still prohibitive, due to being employed, and the financial cost of attending ERS has been discussed by Hanson *et al.* (2019) as a barrier, while Morgan *et al.* (2016) and Birtwistle *et al.* (2018) have highlighted the impact of losing the subsidies following completion of an ERS as an issue. However, on the whole, finance did not appear to be a barrier in this study, particularly as the participants did not complete and lose the subsidy to continue attending. Although

some participants had significant issues with some ERS staff, and this linked to reasons for dropout, or a barrier to adherence, in many instances the staff were seen in a positive light. They provided facilitation in terms of motivation, support, making the participants feel safe and appeared to be approachable.

Despite dropping out of the ERS, participants did describe the benefits they gained from it, and continued benefitting from, after their limited time within the scheme. Some described it as providing a push to be more physically active, try other options such as walking, classes or activities, with examples of weight loss as a result. Some described continuing to use what they learned within the ERS to help them keep active, such as using gym equipment or an exercise plan they were given within the ERS. Due to the paucity of research regarding ERS dropouts, comparisons to these findings is difficult.

5.6.1 Strengths and weaknesses of the study

-Strengths

This study is the first to selectively investigate ERS dropouts, to provide information on why they dropout, understand what the barriers to adherence were, and how they would improve the ERS in the future. This study successfully investigated participants under the age of 55, who dropped out of the ERS within the first 6 weeks of starting the scheme. A need to investigate the views of ERS dropouts has been identified (Eynon, O'Donnell and Williams, 2018; Hanson *et al.*, 2019), and this study provided insight into a population which is at most risk of dropout, and a group that were difficult to reach. The participants provided a range of suggestions to improve the delivery, content and support within the ERS. Methodologically, the use of framework analysis in this study was a strength, as multiple coding and a clear audit trail, provides peer scrutiny and verification of analysis, therefore improving trustworthiness.

-Weaknesses

Recruitment was difficult, however, as the analysis process revealed, there were no new codes developed within the final interview, therefore no new themes developed, suggesting that data saturation had been reached (Fusch and Ness, 2015). While the concept of saturation has multiple meanings and limited transparency (O'Reilly and Parker, 2013), this study employed a predominantly inductive approach (using

mixed coding), with a focused research agenda, therefore increasing the potential for saturation to be reached (O'Reilly and Parker, 2013).

The time between dropout and interview was not recorded, but was within two years as per the inclusion criteria. This range of time increases the risk of recall bias (Althubaiti, 2016), and the interviews are able to only gain what the participants were willing to disclose or recall (Hanson *et al.*, 2019), therefore it is not possible to discount inaccuracies within the data. The previous study in the thesis not only identified that those under 55 were more likely to dropout out, but also that smokers were also likely to dropout. Ideally, this would have been part of the inclusion criteria. However, due to issues with recruitment, this additional criteria would have likely made recruitment too difficult. The limited experience of the researcher, may have impacted on the depth of the interview questioning, resulting in an undeveloped theme (Connelly and Peltzer, 2016), in relation to the dropout reasons.

5.7 Conclusion

This study was undertaken in part, to address and was informed by the research recommendations of Williams *et al.* (2007); Pavey *et al.* (2011a); Hanson *et al.* (2013); NICE (2014b); and Campbell *et al.* (2015). The key recommendations informing this study focused upon understanding why ERS are less successful for certain groups (participants aged under 55 years), what factors encourage uptake, adherence and include any barriers preventing participation. This study is the first to specifically investigate the experiences of ERS dropouts, especially within a population that is more at risk of dropout. The findings revealed that communication played a significant role in dropout. Communication issues impacted on the individualisation of the scheme, and was discussed as an issue, in various guises by the majority of participants. Participants valued individualisation and desired more autonomy. Some reported a lack of motivation as barrier, while many did not like the gym setting, which limited aspects of individualisation and autonomy. Participants desired more information regarding PA, nutrition, and were keen to utilise options to keep physically active beyond just a gym setting. This study highlights the importance of communication and providing information for participants to develop autonomy regarding PA. This study has demonstrated that a lack of time, pain, not feeling listened to, feeling the ERS was not appropriate for them, expense, medication issues and the gym environment itself were reasons for dropout. Gaining the views of non-adherent participants has provided novel insight

into why participants dropout of a scheme, and has highlighted barriers to adherence. However, gaining insight into the barriers that participants have successfully overcome, using the views of successfully adherent participants within the same scheme, will provide a more holistic view of the scheme. This leads into the second part of this study, a focus group, consisting of participants that successfully completed the scheme.

5.8 Part two: Focus group

5.8.1 Aims

Within the limited number of qualitative ERS studies, most have included the views of successfully adherent participants, often focusing on perceptions of success or motivations for attendance (Mills *et al.*, 2013; Moore *et al.*, 2013; Eynon, O'Donnell and Williams, 2018), without gaining insight into how participants overcome barriers or could improve the schemes. There is also limited comparison between adherent and non-adherent participants within the same scheme. Therefore, by gaining the views of participants that successfully completed the ERS, part two of this study aims to:

- Increase the understanding of what the barriers to adherence are.
- Increase the understanding of what the facilitators to ERS adherence are.
- To explore how to overcome/facilitate overcoming the barriers and enhance the facilitators.
- Explore how ex-participants would improve the scheme for future participants

5.8.2 Design and sampling

A qualitative design, using a semi-structured focus group was employed. Focus groups aim to gain the views, beliefs and attitudes of participants with similar or common experiences (Finch, Lewis and Turley, 2014; Green *et al.*, 2015). They are therefore suited to investigate the experiences of participants from the same ERS. A focus group functions by interviewing participants together therefore, gaining multiple views within a smaller timeframe (Green *et al.*, 2015), typically meeting once (Finch, Lewis and Turley, 2014) meaning they have the advantage of gathering multiple participants and collecting data within one event. Focus groups can improve service provision (i.e. the ERS), as a group of service users may be less intimidated to provide their views (Green and Thorogood, 2018). Focus groups depend on simultaneous attendance by participants. As all potential participants had

successfully completed the ERS, it was predicted that they would be likely to attend a focus group, and be willing to discuss their experiences in front of others.

Purposeful sampling was utilised to ensure all of the participants could provide insight into the experience of completing a referral scheme. Maximum variation sampling was used to gain diverse opinions across gender and age. Recruitment focused on gaining a minimum of two participants within the following age ranges: 18-30, 31-54 and 55+, with equal distribution between both genders and barriers to exercise.

5.8.3 Sample size and Recruitment

The focus group aimed to recruit 6-8 participants, based on the recommendations of Finch, Lewis and Turley (2014), as a smaller group may be more suited for participants who are engaged with the research topic, where depth is more important that breadth. It was hoped that successfully adherent participants would be interested in the topic. Since the topic was subjected to limited investigation, depth, as opposed to breadth of data of was prioritised, therefore suiting a smaller group (Finch, Lewis and Turley, 2014). Participants under 18 years were excluded due to ethical agreements. No upper age limit was imposed, as the findings of chapter four and ERS literature, report that older participants are more likely to adhere. Participants were identified using the same methods as in the interviews. The ERS database was used to identify participants that completed the scheme and cited a lack of motivation or childcare as a barrier. These criteria were underpinned by the chapter four findings, where these two barriers predicted adherence. To limit recall bias and having up to date contact details/addresses, only those who had completed the scheme within the last year were selected. An electronic Microsoft Excel file was populated with potential recruits, including their addresses/contact details and stored within the ERS safeguarded PC network (as per ethical agreement).

Recruitment started by posting a cover letter explaining why contact was being made, together with a participant information form, a consent form, and reply slip (Appendix 7). Blocks of 20 recruitment letters were posted, to reduce the likelihood of being unable to recruit interested participants secondary to over recruitment. Each block contained 6-7 participants falling into 18-30, 31-54 and 55+ age brackets, with an equal split between gender and the two barriers to exercise to gain maximum variation. Interested participants would return a reply slip in a freepost envelope.

Once this slip was received, contact would be made with the participant via phone or email (participant choice) to discuss the research in more detail if required, and the focus group date. This process was not successful. A likely factor was the ERS ceasing to record barriers to exercise in the initial assessment. This occurred within the last year, meaning that individuals identified in the database, had completed the ERS at least one year prior, which could limit participant's desire to attend. Therefore, telephone recruitment as per the interviews was utilised. ERS staff also recruited by distributing recruitment packs during the final assessment before participants were discharged. The drawback of this, was an inability to recruit participants citing a lack of childcare or motivation as a barrier, and could not be circumvented. However, interviewing participants that completed the scheme still provided an opportunity to investigate any barriers they may have had, how they overcame them, and was able to address gaps within the literature. This adapted recruitment process minimised recall bias and presented an opportunity to gain contemporary views of the scheme. Ethical amendment was approved (HLSMK060716, 13/2/17) to include telephone interviews and to use ERS staff to recruit. In response to this, the focus group interview guide was amended to investigate if the participants could recall any barriers that they had before or during their time within the scheme (Box 5.2). The final recruitment numbers and participant characteristics are included in Table 5.4.

Table 5.4 Breakdown of gender and age of focus group participants

Participant number	Gender	Age
1	Male	70
2	Male	65
3	Male	64
4	Male	70
5	Male	70
6	Male	69
7	Male	68

The focus group lasted 93 minutes. JN attended, taking field notes while MK facilitated the focus group. Participants received a debrief sheet containing a unique participant ID code, detailed information regarding the research and contact details of the researcher and the university ethics officer. All participants received a free swimming pass worth £3.90 to be used within the council run pools as compensation for their time

5.8.4 Focus group interview guide

The guide (Box 5.2) was developed to cover the areas where there was limited knowledge, while supporting the structure of the focus group. The guide aimed to avoid overburdening the participants with a wide range of topics, which could dilute the depth of discussion. The guide focused predominantly on the barriers to exercise and how to improve the scheme. The beginning aimed to support a "neutral opener", facilitating group discussion and dynamics. The main discussion focused upon varying facets of barriers to exercise, including the identification of barriers, what effect they may have had and how they were overcome, as this is a poorly understood topic and a key aim of the study. Finally, the ending focused on improving the scheme, as it would likely be a positive discussion and avoid an abrupt finish.

Box 5.2 Focus group interview guide

Scene setting and ground rules
Introduction & Expectations,
How focus group will be conducted.
Individual introductions
Researcher introduction,
Participants introductions,
The opening topic
Enjoyment/benefits of the scheme, why did you enjoy/benefit and maintain attendance
Main discussion
Did you feel there were any barriers present before starting scheme?
Did any start during the scheme?
What, if any, effect did they have on you before the scheme
What, if any, effect did they have once you started the scheme
How did you overcome the barriers?
What helped you complete the scheme?
Are you still physically active, if so how and where? (i.e part of the scheme)
Ending the discussion
What advice do you think people starting the scheme would benefit from and why? How do you think the scheme could be improved? How would you advise someone to keep active?

5.8.5 Equipment and transcription.

The focus group was audio recorded, using two devices (Olympus digital voice recorder DM-550, and Olympus digital voice recorder DS-40) to provide backup and to ensure all participants could be heard. The data were secured in the same manner as the interviews. Transcription was conducted through a professional service. Any details or information discussed during the focus group that could make participants or health professionals identifiable were not transcribed, and replaced with a blank to ensure full confidentiality.

5.8.6 Data Analysis

Framework analysis as described by Gale *et al.* (2013) and utilised for the individual interviews was employed, supported by NVivo (Version 11, QSR international). The process is described below and is used to highlight minor differences between the individual interview and focus group analysis.

Transcription

The transcription service highlighted unclear data, in terms of understanding the words, or which participant was speaking. Each highlighted point was individually addressed by the researcher. Field notes taken during the focus group by the researcher and JN were consulted to aid this process, in addition to the use of data from both audio recorders.

Familiarisation

This followed the same method used within the interview analyses where notes were made while listening to the audio.

Coding

Coding followed the same process employed during the interview analysis. However, each individual participant was also coded, so their contribution could be viewed in isolation if required. Although data from each individual participant was coded, the data was analysed as a whole group, therefore treating the data as a whole unit of analysis (Spencer *et al.*, 2014). As the data was generated from a homogenous group, consisting exclusively of males over 64 years, analysing the data as a whole group was deemed more appropriate, as analysis at an individual level within focus groups is often limited, compared to individual interviews (Spencer *et al.*, 2014). A coding diary was used to support the process. Following the coding process, various topics regarding the effort required, the benefits of exercise, and barriers or facilitators for exercise were commonly cited.

Developing a working analytical framework

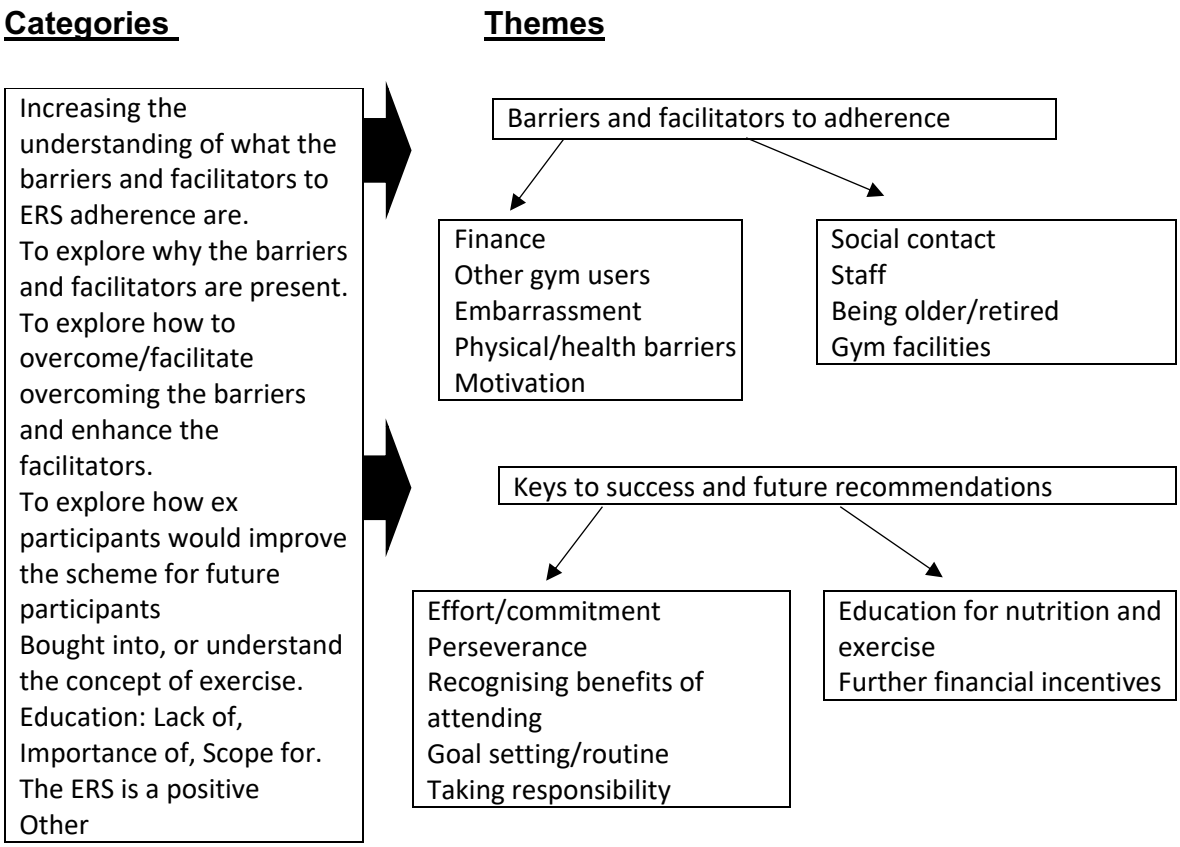
This stage, and the subsequent stages followed the same method employed within the interviews, with a supervisor (JN) independently coding the data and reviewed in a coding workshop. The only difference to the interview analysis was that the data

was analysed as a whole group, therefore charted as one row within the matrix, as opposed to a row per individual participant.

5.9 Findings

Two overarching themes were identified from 8 categories during the analysis, “Barriers and facilitators to adherence”, “Keys to success and future recommendations”. The focus group was able to address the main research aims. However, during the process, participants discussed various topics that were not directly related to the aims, but provided context to the participants involved, and their journey into the scheme itself. For example, cardiopulmonary issues were often described as the reason for instigating a referral. Participants often set their own goals, the majority of which related to weightloss. Some of the participants described being relatively active and healthy up until their later years, then developed a more sedentary lifestyle which resulted in health issues. Despite all of the participants being able to successfully complete the ERS, there was not a consensus on whether the participants actually enjoyed exercising with views ranging from “I love it”, to an apathetic “nah”. Diagram 5.2 includes the categories and themes developed during the analysis and will be discussed forthwith.

Diagram 5.2 Categories of codes and identified overarching themes



5.9.1 Barriers and facilitators to adherence

Participants discussed a range of topics regarding barriers to ERS adherence or PA itself, or conversely, to facilitators of ERS adherence or PA. Their views often related directly to their own experiences of barriers and facilitators, but also included what they perceived to be barriers or facilitators for other attendees, most notably women. Barriers could be tangible such as finance, but also less tangible, such as experiencing embarrassment, or lacking commitment or effort. The ERS itself was described as a facilitator, as it was able to overcome historical barriers for the participants. The barriers to ERS adherence and continued PA will be discussed first, then followed by the facilitators, as in some instances, the ERS was seen to have helped participants overcome some of their barriers.

-Barriers

As stated, all of the participants had successfully completed the ERS. However, they still faced various barriers that needed to be overcome. The financial burden of attending the gym was highlighted and agreed upon by the participants. In one case, the participant was historically a regular gym attender, however, the price of the monthly fee increased, and this directly impacted on the overall attendances:

> *P#4: [the] council started to increase the price dramatically.*
> *Other respondents: [muffled agreement]*
> *P#4: Because you were paying, as you do here, a monthly fee. And it was the time they were building the Olympic-sized swimming pool. And the fee went from something like £19 – this is back in the early 2000s – to £37 a month. And the classes, at one stage, and the circuits, were £72 [for the monthly membership]. Until they were getting good attendances, and went down to 6, 7, 10 [people]. People just couldn't afford it. So, because of that I stopped. And I never really got back into it again.*

Later within the focus group, the participants were asked if they were not part of the ERS, and as a consequence could not receive discounted fees, would this be a barrier to exercise- all agreed that this would present a barrier.

The impact of other participants or people using the facilities was also discussed as a barrier to attendance, often in terms of social interaction being a distraction or an annoyance. These views were often framed as a barrier for themselves, but also the perception that it may be a barrier for others, and served as a poor example for others:

> *P#1: If you think you can go and just stand about, giving at that [makes nattering hand gesture] to your mates, you might as well go home. You have got to put the effort in….P#1: Because I used to watch them, and they keep*

saying to me, "Ah, you're doing great, how do you do it?" I says, "Because I'm not doing what you're doing, not giving at that [makes nattering hand gesture] all the time."

There was a perception from some members of this all male group, that women attended mainly because they wanted company or camaraderie, but that this would hinder any progress, because they were not putting in the amount of effort required. Additionally, they were sympathetic as to how females may feel when attending a gym environment and how this could be a potential barrier to female attendance. The perception was that being a lone female within a gym, surrounded by males, would be intimidating, particularly in relation to feeling body conscious. However, due to the lack of women in the focus group, it was impossible to get a female view on this.

Feeling embarrassed or intimidated when in the gym was highlighted. This included feeling embarrassed oneself and causing embarrassment to other people:

P#6: Me chest, coughing, and bringing mucus up. I felt embarrassed in front of everybody else. Because sometimes I was coughing, and it was just coming up, and I couldn't cover me mouth with…And I said to her, "Look, I'm not… I'm a bit embarrassed. I hope I'm not embarrassing none of you." …. Or they think that they may get what I got, but, you know, they'll not… That was the cause, I'd run out and go out the side of the… and cover me mouth you know… That was one of the big things with me, still is, because I still cough and I still bring mucus up.

Other participants described physical barriers, including pain or other health issues such as COPD and obesity. Participant 2 described how obesity was a physical barrier that he needed to overcome:

P#2: Well, I can tell you about one barrier, and that's me weight. I was 21 stone. So I'm down to 18 now so it was a big loss….
I: So you say weight can be a bit of a barrier… P#2: A barrier, of course. When you're trying to do similar things to everybody around you, and you're finding it darn hard, you know?

Motivation, or the lack of it was a barrier that was discussed by the participants. A lack of motivation, was often linked to a lack of time:

P#6:So, instead of doing the exercise a little bit, I just stopped in the house. And said to me wife, "Bring my dinner here" – well, not like that, but she used to bring me dinner here. I used to sit and watch the television, go on the computer. And I was just degenerating to… Put weight on, Went up to 18 stone.

P#4: So, you've got to weigh it all up. And it's lifestyles as well, because people do different things. And they've got different commitments, especially if you're young. You've got a young family, you've got to play with the family. I've got grandkids, I see them every now and again, but they don't half run around the

garden. [Laughs] But that's what it's about, it's lifestyle, isn't it? You know, it's difficult to fit in at times.

Other issues that participants thought might be barriers for people included having unrealistic expectations of what could be achieved via exercise, and attending the scheme because they were told to do so, without having a personal desire to attend. One participant bought up an issue with the aircon system in one of the gyms, however, this was not a point that other participants agreed with. On the whole, participants did not focus as much attention on barriers, compared to facilitators.

-Facilitators

While participants did highlight that in some instances social interaction could be a barrier to exercise, or at least making progress, it was acknowledged that social interaction within the scheme was advantageous. The social aspect was seen as a motivator for finishing a class/session, or for continued attendance overall:

P#5: But, I find, I enjoy it. And a lot of people just seem to going more for the camaraderie and the social part of it. And I still think that's good…Because, as you're led to believe now, for older people, loneliness is as much against your good health as what physical exercise is.

Aside from supporting the exercise session itself, the social benefits gained from attending after the session were also perceived to operate as a facilitator. The opportunity to meet other people, get to know each other, and catch up was described as something that encouraged attendance.

The staff were viewed in a positive light, Participants appreciated the ERS staff, not just from a safety perceptive, but also from the perceptive that the staff could facilitate effective exercise:

P#4: They're all approachable. You can talk to them all. They'll tell you what they want... For me, there is no issue from that point of view

P#2: There, they virtually… They act as a team, you know. There are usually about two or three of them, and they are constantly going around. If they see a person lifting up and it's the wrong manner they'll point it out to them, and help them, you know.

Although the overall discussion regarding the ERS was very positive, not all participants were in full agreement. Participant 1 did not feel the staff were trained beyond a 6 week course and felt that he was held back by the staff for doing too much.

The participants recognised that the ERS helped overcome various barriers to exercise. Participant two for example, explained how the scheme helped him to lose

weight, Participants all agreed that the ERS helped overcome the significant financial barrier that has previously been highlighted as an issue. The individual attendance price was seen as a positive, but also the monthly gym fees, once they had completed the ERS:

> *P#3: You see, as far as cost's concerned, I think it's brilliant.*
> *P#4: Well I pay 17 quid there. And if you park over here, you pay £25 for your parking fees…*
> *P#3: But for £17, you can go to the gym as many times as you want and you go to as many classes as you want.*

Being older and retired was viewed as a facilitator, as it provided financial benefits and more time to exercise. It was also recognised that younger participants had to pay more, suggesting that this could be an issue for younger participants.

The quality and choice of facilities to attend was highlighted as a facilitator. Participants recognised having more space in an aerated gym, and an ability to exercise across various locations within the council district. A final aspect regarding the ERS, was that it was viewed as providing an overall benefit. This was in terms of providing information to help people, as participants recognised that much of what they did in the scheme could be applied in other situations other than the gym (i.e. using tins instead of weights in the house), but also because the scheme itself was a benefit to the community and helped overcome barriers, or was a facilitator for many people:

> *P#5: That's exactly the same for myself, getting blood pressure down, cholesterol if possible. But, as you say, there's a lot of people here who will have got an awful lot out of it, because its seems as if the majority in here are coming here, or they're going down to [leisure centre], from further up the river in [small towns] and [small village]. It seems to be a little bit more relaxed by the sounds of it. And you find the people that go to the classes at [small town] at [leisure centre], also go to [small village centre] and they all know each other. And it's like a big social group. And they all seem to get on, they all seem to enjoy it, everyone enjoys it.*

5.9.2 Keys to success and future recommendations

A theme generating some of the strongest viewpoints, most of which were agreed upon by all of the participants, related to what they considered as keys to successful completion of the scheme. Participants were keen to discuss what helped them to complete the scheme, and what advice they would provide to people about to embark on the scheme. Additionally, participants discussed keys to success and drivers to maintaining exercise after the scheme. Finally, Participants provided suggestions how to improve the scheme in the future, but this topic did not generate

as deep a level of candid discussion as did the question around the keys to success.

-Keys to success

In order to successfully complete the ERS, and maintain PA levels, the participants highlighted what they considered to be keys to success. Broadly, they could be linked in terms of effort/commitment, or perseverance and goal setting with objective markers of progress. Effort and commitment were discussed by various participants as keys to success. These attributes were seen not as a benefit to have, but as a pre-requisite needed to complete the ERS. Participants were unequivocal in their feelings about this:

> *P#1: You know, you see some of them, and they are just there because they have been told to go, and they're not even trying. You have GOT to try. That's the secret, you've got to try. If you think you can go and just stand about, giving at that [makes nattering hand gesture] to your mates, you might as well go home. You have got to put the effort in. R1: I says, a bairn of 5 can do these… I says, I've got to… If you don't push yourself, you don't get any better. You've got to push.*
> *P#7: No. The 2 bits of advice I got, right, were put the effort in… and like the man says [P1] you've got to put the effort in, right… And don't smoke. I've smoked since I was 14. I jacked it in, total. Gone. And I went there and I put the effort in, and I got better. As the man says, you do it, you get better. I have always been pretty fit, but if you don't put the effort in, and don't go… If you keep smoking, and don't go… Waste of time.*

While effort and commitment were seen as pre-requisites, perseverance, particularly mental perseverance, were seen as key ingredients for success. Perseverance was required in order to overcome barriers such as pain, but also because many of the benefits from exercise may not be realised in the short-term:

> *P#1: People expect miracles. You've got to… It might take a while. It cannot be done in 3 weeks.*
> *P#7: Of course not.*
> *P#1: You've got to keep [on]*

Later in the interview, the same participants followed up with this final piece of key advice, which highlights the importance of perseverance, and also makes links to measuring progress, which was another key to success:

> *P#1: Keep on it…*
> *P#7: You've got to do the scheme. You've got to do it. These exercises… You need to feel better. Or be told you're better. Otherwise you just lost heart. You understand what I'm saying? You just go on and on and on, and think, "Well, what the hell am I doing?" You have to do… You need proof or feel better yourself. It doesn't matter what you're going to do, but you need it.*

The participants had a range of personal drivers that motivated their participation

and maintained effort. The drivers could be health based, e.g. trying to reduce the risk of a heart attack or the management of a long-term condition such as COPD, image related – i.e. being seen to do "something" or reward focused - once they have earned it through exercise. Recognising the benefits of exercise appeared to be important, even if exercise was not a "cure", but a method of managing a condition:

> *P#1: Helping me breathing. It's the only thing that does help me breathe. All the medication that I take, the best thing in the world is getting to the gym and starting…*
> *…P#6: My chest is never going to get better… Gets worse and worse and worse…*
> *P#1: … cannot do much with lungs.*

Seeing or measuring improvement was deemed to be as important as putting effort in. An objective maker or sign was often discussed as helping the participants to stay motivated during the ERS. Participant 7 highlighted the point of having an outcome measure and how he was told exercise would improve his xray image:

> *P#7: I want proof. The trouble is here, these men here, they haven't had any proof they're getting better. They're doing the exercises, but they need a doctor or an x-ray or whatever.*
>
> *P#7: And she was true! I done the 10 [weeks], twice a week. I went back, and she put it back on the telly, you know, and she showed is the before and after, from severe to mild. And that proof, the proof they give you…*

This was the first of various discussions regarding the importance of seeing a change due to exercise. Participants 5 and 6 discussed their ways of measuring progress, which revolved around weight, blood pressure, waist circumference and reduced alcohol intake. Both participants could provide very precise details about the changes in each measure, indicating the importance of the changes to them. The use of a 6 week halfway assessment helped, because it provided a checkpoint to highlight progress. The participants did not value a random outcome measure. They recognised that goal setting was important, not only in itself as an activity, but that the goals needed to be realistic and meaningful to them as individuals. In these instances the goals they had set, were used as the outcome measures they related to their success, and what was required to complete the ERS:

> *P#2: Yeah. You need them to set a goal… Personal own-goal for themselves…*
> *…P#6: I think you set your own goals.*
> *P#1: That's it.*
> *P#6: And I think when you reach that, you set another one. You do that, I think that's half the thing of… Feeling fit, you know.*
> *I: So you've got some kind of goals set in conjunction…*
> *P#7: Well, it was in front of me eyes. She says, come back out in 10 weeks, you'll be better.*

I: So you've got those kinds of goals…
P#7: Aye, well it was great.

In order to support goal setting and successful completion of the ERS, the participants highlighted the importance of pacing, how to measure pacing, and that developing a routine was another key to success. Pacing was seen as key because it helped participants avoid any negative side effects of exercise. Interestingly, the methods of pacing did not appear to link to any specific objective measures, they were more closely linked to subjective measures:

P#4: I always listen to me body. If me body's telling me it's getting sore, I slow down.
P#1: That's it, the way you feel.
P#4: Because this is what it's all about. It's not about just keeping going, going, going, breaking barriers. Because sometimes I feel my heart thumping, you know, with the stent in. What I do is I switch the miles-per-hour down on the runner by 5 miles, 6 miles per hour. Then it starts to get better, and then I can increase it again. It's… understand what your body is telling you…

Participant 4, highlighted the importance of routine. Routine helped him enjoy exercising, and provided an ability to deal with the possibilities of his routine being disrupted. For example, if other people were using a particular piece of gym equipment, part of his routine was to work out how to compensate for this, by using other options in the gym. However, the first part of his routine, appeared to be the most important, at the start of the day:

But you get out of the habit of going, and it comes down to a habit. I get up in the morning now if I'm coming up to the gym, I get me shorts on and me t-shirt on, and I'm sitting downstairs, having me breakfast, watching a bit of TV, I think, well if I don't go, I'm not going to go. But once I'm changed, you get into the mindset where I've got to go…

Participants also discussed how taking responsibility for their exercise was important, doing something was always better than nothing, and part of this was having an individual mind-set to support this. This mind-set could be the realisation that no one else can make you exercise, or that individualised exercise would be more appropriate:

P#2: I can't… So, as I said, it's just down to me. There's no other… I've got no other choice. It's down to me... Someone said, "If it has to be, it's down to me." You know, so I stick with that….
…P#4: You have to have a mindset where you are just doing it for yourself. Therefore, you work to your own regime, you work to your time, you're not trying to compete with other people…
…P#4:That's what it's all about. It takes a specific individual, if you like, or mindset, to go here on your own, because you arrive on your own, you exercise on your own, and you go home on your own… It does take an individual mindset for that….

The benefit of having an individual mindset appeared to support motivation and continued progress. It was seen that attending served to benefit the individual, not others attendees, therefore comparison to others was not important, whereas focusing on yourself was:

> *P#4: Yeah. I want to beat last week's effort.*
> *P#5: Yeah, once you've started you get going. In fact, for me it's become a little addictive*

> *P#4: I would say there's 2 things. First of all, is don't be intimidated by how some of the youngsters there run or exercise because they are bloody good.*
> *P#1: They're young lads, it's as simple as that!*
> *P#4: I couldn't even run at their pace when I was their age, let alone now. So, don't be intimidated, basically.*

All of the participants barring one, who was due to restart exercising again, were engaged in exercise following the ERS. Participants described a range of exercise/activities they engaged with; including the gym, weights, rowing, cycling, badminton or classes/group exercise. Some participants described how much activity they were doing, ranging from two to five times per week, although not all participants discussed this. The following sections highlight some of the keys for success and drivers to maintain exercise, following ERS completion. For some, exercise felt addictive, others cited reasons which linked to the aims of the ERS, as they aimed to either prevent developing conditions, or help manage their conditions:

> *P#3: Well, I'll start off by saying that I feel a bit of a fraud. I seem as if I've been referred to try to prevent me having, or reduce the risk of heart attack, because I've got high blood pressure and high cholesterol…*

> *…P#2: I've had to lapsed it the past 6 weeks, and I'm worrying that I may start to deteriorate again, so I must get back to doing the exercising again. So it's very, very important for us. It's helpful…*

The participants believed that "exercise works", after observing improvements to their health. They observed and described a range of benefits, grouped into physical/physiological improvements, or descriptions of feeling better. Participants described different physical or physiological benefits gained from exercise. Some focused on the improvements exercise had on their breathing, whereas others focused upon tangible benefits, such as weight, blood pressure and waist circumference, while others discussed the changes in their yearly health check:

> *P#4: I found that since I've been doing the exercise, my blood pressure is far better than it's ever been for a long, long time. My cholesterol's way down as well.*

In terms of "feeling better", the participants described a range of ways that they felt

better, some with quite dramatic descriptions of the change they underwent during the course of the ERS:

> *P#3: I have got more energy, and I feel more motivated. And I think the class has helped us to… I think if it wasn't for the classes, I would have just sat in the house…*
> *…P#2: And after completing the programme, from being a virtual walking zombie, I'm a long way better. I know the exercises have helped…*

Participant 2, made links between the physical benefits and how they reduced the perception that he was like a zombie and provided more confidence to take on future challenges:

> *P#2: It strengthened several of the main muscles for us, so I was able to walk again. I still can't walk very far, I have to stop and carry on. But I couldn't even do that when I came into the programme. The machines they put us on, there's obviously the cardio, to help us with the… It's been a slow programme. But I feel as though I can tackle almost anything now, you know?*

While the participants were forthright with the benefits they observed or experienced with exercise, it was acknowledged that the improvements could come with a cost. For participant 6, he described feeling "terribly tired" and wanting to collapse on the bed. While not described explicitly by the participants, it may be drawbacks such as tiredness, which are in part, reasons why they felt resilience is required.

-Future recommendations

The participants responded to questions related to improving the ERS, by suggesting an increase in educational support/content, while also providing advice for new participants, on what it takes to successfully compete the ERS. Most recommendations were made within the context of minor amendments, as the majority of participants were happy with the ERS in its current form.

Increasing the educational support was the aspect where they felt that the most changes within the ERS were required. Participant 4 summed up why he felt education was important:

> *P#4: I think you're right in what you're saying that it's a mixture of both. A), you need to be trained and taught what to do. And B), you need to be able to go and ask somebody about whatever is there.*

The participants recognised a link between nutrition and health, while alluding to sedentary lifestyles and weight gain. Participant 6 summed up the recognition that balanced diets are important, following a failed attempt of dieting using liquids alone:

> *P#6: I think eating plays a big part. "You are what you eat." You know, let's face it, you are. If you eat all the wrong things and you eat too much, and you*

don't exercise enough, you get bigger.

While understanding the link between nutrition and health, a recognition existed that their dietary knowledge needed to improve, and the ERS could support them with this:

Respondents: [muffled agreement to suggestion of nutritional support]
P#4: I think that would be helpful, because we've all got our own problems, and we all have our own dietary needs, and a new diet would probably help everybody here manage their particular problems.
P#1: It would definitely help me.
P#6: You mean this scheme here?
I: Aye, specifically this scheme. What would you do to try to help improve it?
P#1: Diet… What we were saying, because you get nee help with that.

Although the participants lacked confidence in their nutritional knowledge, they appeared very confident in how much exercise they should be doing- despite the fact that they could not agree to, or come to a consensus of what constitutes an appropriate level of exercise. The views of the participants regarding exercise ranged from being quite surprised during their first experiences of guided/supported exercise, to becoming almost accusative and critical of others within the group, based upon their views of what constituted too much exercise, as highlighted within the following interaction:

P#5: I go 5 days a week to the gym for an hour and a half, in the gym, and then finish one and go down and, say, play badminton. But, come the end of the week, I'm absolutely knackered.
P#6: See, I couldn't do it…
P#5: So, I don't know if it's actually doing… too much.
P#6: … You're doing too much.
P#4: To be fair, it's looks like it's probably better… having a rest, exercise, rest, exercise, rest and doing it that way. Because you're body…
P#6: You're doing too much…
P#4: If you do too much, your body is tired, and it's still trying to recover. And you can put more into the next time you go, that's important.

It is interesting that it did not dawn on the participants that exercise levels may be suitable for some, and not others- despite most participants agreeing earlier in the interview that exercise should be individualised. Although there was a recognition that being taught what to do was important, this interaction suggested that a future recommendation could be clearer information on exercise, despite the fact that the participants appeared more confident in their knowledge about exercise compared to nutrition.

A minor suggestion related to providing further financial incentives, to continue making exercise cheaper. Participants recognised the financial benefits they already

received as a facilitator, however the prospect of attendance being rewarded with a free session was considered motivational:

> *P#2: No, no, like a free session. In the gym, or the circuit training, or whatever, you know.*
> *I: Something more… exercise-based?*
> *P#2: Exercise-based, yeah.*
> *I: It's something definitely to put forward. Is there anything else that you think would kind of help improve the scheme, in any which way? I'm totally open-minded.*
> *P#4: Going along those lines, you could always do a swimming session.*
> *P#2: That's what I'm thinking, yeah.*
> *P#4: Something like that.*

Participants discussed potential pros and cons of introducing a group exercise/buddy system. A buddy system was proposed by some participants, mainly as it was seen as a motivator:

> *P#4: I think that's a good suggestion, because it's motivation, isn't it? Your buddy's going to be there, therefore you're going to be there, and it doesn't matter… You know, for females as well, it would probably be just as good…*
> *Other respondents: [muffled agreement].*

This suggestion was supported by various participants. However, it does not appear congruent with the earlier discussion, whereby social interaction could be a potential barrier, and was not supported as a consensus. The notion of a buddy system was not fully supported for the following reasons:

> *P#6: I just like being by myself. When I go in there, I'll have a bit of a natter, and then when we start, I just do… I don't talk to anybody, I just do the lot... And then when we're finished, or we're cooling down, I'll have a bit of a natter. And then that's it.*
> *Other respondents: [muffled agreement]*
> *P#4: I think it depends upon the individual.*
> *Other respondents: [muffled agreement]*
> *P#5: You've been referred, it's up to you what you do… Like I say, I'm not a great mixer, so when I to go the communal the badminton, or the circuit training, I still tend to stick to myself, or have a quick chat when I'm cooling down with 1 or 2. Where other people, they come in and they want to chat to each other, and they're chatting all the time.*
> *Other respondents: [muffled agreement].*

Introducing walking football to the ERS was not well received by the group. A limitation of this (or group activities such as badminton) was the potential for participants to be sat out waiting a turn, or taking time away from exercising in the gym itself. Additional support from professionals such as Physiotherapists was not required, and improvements were seen as "fine tuning" only. A key message from the participants was that they were very satisfied with the ERS.

5.10 Discussion

The focus group aimed to increase the understanding of what the barriers and facilitators of adherence were, how participants overcome barriers, and how to enhance and improve the ERS for future participants. The focus group was able to address these aims. The key findings related to what the participants felt were required to facilitate successful adherence, how the scheme could be improved, and the barriers participants needed to overcome. It is important to acknowledge that the data from the focus group were generated from older males only. This makes direct comparison between the extant ERS research and the findings of this study more difficult, as the experiences of males have had limited focus within ERS research compared to females (Morgan *et al.*, 2016). The impact of collecting data from a male only group will be considered later in the discussion. However, where possible, comparisons with the extant ERS research are considered first, and where appropriate, the wider literature beyond ERS research, specific to males.

The theme receiving the strongest and most views related to what was perceived to be required for successful adherence. In order to successfully complete the scheme, participants felt that effort, perseverance and goal setting with objective outcomes were key to success. Effort and perseverance were viewed as the most important keys to success, which has previously not been reported and is a novel finding. Eynon, O'Donnell and Williams (2018) highlighted goal setting as a facet of self-regulation by adherent participants, while goal setting and measuring progress with diaries has also been favourably reviewed within active lifestyle services (Wormald *et al.*, 2006). Goal setting was not random, participants stated that goals should be specific to the individual and realistic within this study. Eynon, O'Donnell and Williams (2018) describes participants successfully completing an ERS, and attribute personal goal setting towards motivation for supporting adherence. Eynon *et al.* (2019) also describes participants realising that the process of exercising is a long-term commitment, which was also recognised by participants within this current study. While Morgan *et al.* (2016) stated that goals in terms of benefitting physical and mental health may be an adherence facilitator, it does not appear to be in the context of individualised goal setting, as discussed by the participants within this current study. Developing or keeping to routine also appears to support attendance within this study, and that of Morgan *et al.* (2016) and Eynon, O'Donnell and Williams (2018). Interestingly, this study and Eynon, O'Donnell and Williams (2018) highlight examples where participants use their gym kit to support a routine.

Measuring improvement was important for participants, offering an element of proof of progress, and this supported motivation. Morgan *et al.* (2016) discuss how perceived improvements in physical health may be a facilitator to adherence, including weightloss, PA or other measures such as blood pressure. However, a significant portion of these findings were based upon PhD theses, or participants who recognised physical improvements but did not link them with a requirement to support adherence (Stathi, McKenna and Fox, 2004; Wormald and Ingle, 2004; Taket, Crichton and Gauvin, 2006; Wormald *et al.*, 2006; Sharma, Bulley and van Wijck, 2012). Pentecost and Taket (2011) provide clearer findings, reporting that participants who perceive exercise and the benefits associated with it to be important, were more likely to exercise and overcome social or cultural barriers. This current study highlighted that measures beyond blood pressure and weight were important for some participants to measure progress, with one participant reporting that pre-post radiographic findings "proved" that he had made progress due to the exercise. Participants clearly recognised the importance of exercise and that "it works" for them. Eynon, O'Donnell and Williams (2018) reported that successful participants recognised the benefits of exercise, and felt that it was personally significant for them, therefore relating to this study. Participants described a range of benefits, including weightloss or reduced blood pressure, a finding also reported by Morgan *et al.* (2016), where participants recognised the physical benefits of attendance.

Participants described feeling better as a result of the exercise, and recognised that exercise was beneficial for the prevention or management of long-term conditions. This indicated a link between motivation to maintain exercise, and recognition of the associated benefits. Eynon *et al.* (2019) reported similar findings, where external motivation was linked to the recognition of exercise benefits. Barring one, all participants continued exercising after the ERS. This may be due to realistic goal setting, making exercise a habit, or that they recognised the long-term benefits from committing to exercise. These are all aspects of which Eynon, O'Donnell and Williams (2018) recognises as part of "exercise identity", whereby participants perceive themselves to be "exercisers" and view exercise as part of their lives and routine. Hardcastle and Taylor (2005) appear to be the first to discuss the concept of an exercise identify within ERS, which investigated the viewpoints of adherent older female ERS participants. Similar traits were identified within this current study and Hardcastle and Taylor (2005), where participants prioritised exercise, developed a routine and commitment, while identifying elements of achievement

and autonomy. While this study differs to Hardcastle and Taylor (2005), which only included older females, it does share similar ages of participants and investigated a homogeneous group, both of which provided insight into aspects of exercise identity.

Pacing was important, appearing to link with autonomy, whereby participants had control of doing at least some exercise, even if they didn't feel like it. While pacing does not appear to have been discussed within the wider literature, the review by Eynon *et al.* (2019) cite Hardcastle and Taylor (2005) which reported links between autonomy, control and commitment to exercise for participants to exercise on their own. Participant's recognised that taking responsibility was important and that no one else could make them exercise, mirroring the findings within Eynon, O'Donnell and Williams (2018).

Some participants discussed partaking in extra exercise beyond the ERS, such as cycling or badminton. Eynon, O'Donnell and Williams (2018) reported similar findings with adherent ERS participants, stating that the ability to schedule exercise, set goals and self-monitor health appears to have a positive impact of participant's ability to exercise. It may be that these attributes, regarding goal setting, routine and monitoring are components that support adherence, and appear to be linked, within this study and the wider literature. Gender differences in motivators and preferences for PA in older (60-67 years old) Australians has been investigated and support these findings. van Uffelen, Khan and Burton (2017) reported that females were less likely to prefer, or be motivated by PA activities that are competitive, vigorous or conducted outside compared to men, while females had a preference for supervised activities. This supports why cycling, which is unsupervised and conducted outside, or a vigorous/competitive sport such as badminton may be attractive to males in the focus group. However, direct competition, or making comparisons to other attendees was not viewed as beneficial by the focus group, and somewhat contradicts the findings of van Uffelen, Khan and Burton (2017) regarding competition. Competition and ego have also been cited as a motivator for PA in Malaysian males, but not in older (41-64 years) adults (Molanorouzi, Khoo and Morris, 2015), while competition and ego have also been reported as motivators for younger males in US university and Greek populations respectively (Zervou *et al.*, 2017; Martinez, Gillespie and Bale, 2014). This may suggest that younger males are motivated by competition or ego, but this is not necessarily carried into older age, such as the participants within the focus group and explains why competition or ego were not motivators or facilitators to adherence.

The participants made recommendations to improve the ERS, predominantly revolving around nutritional education. Knowledge of nutrition was viewed as important, and more education to increase knowledge was requested. This mirrors the findings of the first section of this study, and as per the discussion regarding the interviews, this finding has not previously been reported. Relating to education, participants within the group did not agree upon what constituted a correct amount of exercise, suggesting they were not clear on the recommended levels of PA. This is not a new finding, where Knox *et al.* (2013) reported only 18% of survey respondents could correctly state the current recommended guidelines. Interestingly, Knox *et al.* (2013) reported older males with lower education were more likely to report incorrectly. Although the education levels of the focus group is unknown, it consisted entirely of older males. Despite a lack of clarity regarding recommended exercise levels, the participants clearly recognised the importance of exercise, linking with why participants continued to exercise, despite not necessarily being fully informed about it.

The barriers and facilitators within the scheme was subject to less attention by the participants, compared to what they felt was important to adhere. However, a clear barrier to exercise (and the ERS was seen as a facilitator to overcome this barrier) related to the financial cost of attendance. The subsidised prices offered by the ERS, was a facilitator in terms of adherence to the scheme. Historical price increases by the council, resulted in one participant ceasing exercise. The subsidies were therefore viewed as a facilitator during, and in particular, after the ERS. Hanson *et al.* (2019) identified cost as a barrier to ERS attendance, while Shepich, Slowiak and Keniston (2007) and Birtwistle *et al.* (2018) have reported that subsidised or discounted ERS supports attendance and uptake. Linking to the financial barrier, participants also suggested further financial incentives to support adherence, such as a free gym session, once after they had completed the ERS as a motivational tool. Birtwistle *et al.* (2018) has reported a similar finding, whereby the reasonable price offered was an incentive to continue exercise, however this slightly differed, as free exercise does not appear to have been offered. Having more free time appeared to be beneficial in terms of adherence, with participants recognising that being retired provided free time and some financial benefits. Kosteli, Williams and Cumming (2016) reported that older adults, including males and females, had more free time, when retired, and this was perceived to enable and encourage PA, though the participants were not from recruited from/in an ERS. This contrasts to the participants who were dropouts and interviewed within the first section of this

chapter- a lack of time, often due to work was cited as a reason for dropout, or a barrier to adherence.

Additional barriers highlighted, included other gym users being a distraction or annoyance, or feeling embarrassed in the presence of, or intimated by other users. This highlighted two ways in which the presence of other users could be perceived as a barrier. Despite being barriers, the participants were still able to overcome them, but did not allude to how/why. Perceiving other gym users/peers as barriers appears to be discordant with Morgan *et al.* (2016), Birtwistle *et al.* (2018) and Hanson *et al.* (2019), whereby peers were typically viewed as facilitators. This discordance could be explained by the perception of participants that peers were a distraction (due to talking), whereas the findings of other studies considered peer support in the context of motivation. The focus group also commented on why they perceived a gender difference in the motivating factors or facilitators for attendance. Their perception was that females preferred camaraderie with other females, but this could hinder progress in the gym, while for the participants themselves, social interaction was a motivator to complete a class. The focus groups perception of female motivations/preferences for PA has support in the literature, where van Uffelen, Khan and Burton (2017) reported that females were more likely to be motivated towards PA, in order to spend time with others or to make friends, compared to men. However, this does not support the fact that the participants in the focus group felt the social aspect was viewed as a motivator to complete a class/session.

Being intimidated or embarrassed in the presence of other users of the gym, is not a unique finding within the literature (Morgan *et al.*, 2016; Martin and Woolf-May, 1999). Hanson *et al.* (2019) has also reported how social anxiety may be barrier to attendance, highlighting that peer support may not be universally appreciated by all participants, appearing to mirror the findings of this study. The motivational benefits of other users or peers was commented upon as a possible facilitator (and the use of a buddy system was also considered as a method of improving the ERS) by some of the participants. However, the group did not come to a consensus regarding peer support or the use of a buddy system.

Previous or ongoing health issues were seen as potential barriers, weight being a physical barrier, or ongoing pain being a barrier that needed to be put up with, neither of which have previously been reported upon. In these cases, participants were able to overcome the barriers, however did not discuss how or why, beyond being perseverant in the case of pain. Morgan *et al.* (2016) included studies which

describe health concerns as potential barriers to adherence, however, only Taket, Crichton and Gauvin (2006) provided qualitative data not sourced from a PhD thesis, and did not report how pain was a specific barrier to overcome. They did however report that participants with knee and hip issues had reduced pain following successful completion of the ERS- therefore it is difficult to make a direct comparison to the current findings. Hanson *et al.* (2019) described participants completing an ERS, who expressed concerns about their limitations before starting, however there is no detail about what the physical limitations were, to make comparisons with this current study. Therefore, further investigation of how participants overcome barriers such as weight or pain, may provide insight into this novel finding.

Some participants alluded to limited motivation or limited time as a barrier to overcome. Limited motivation has been alluded to as a barrier to adherence (Morgan *et al.*, 2016). However this was without a clear theme and derived predominantly from PhD studies, or by Martin and Woolf-May (1999), which had minimal focus on motivation, or participants with diabetes (Taket, Crichton and Gauvin, 2006), therefore making comparison to this study difficult. A lack of time has also been highlighted as a barrier, and in some instances a dropout reason (Martin and Woolf-May, 1999; Taket, Crichton and Gauvin, 2006). However, it does not appear to have been investigated specifically within participants that have completed an ERS, who have recognised this barrier. Despite a lack of time being identified, participants still managed to overcome this, appearing to be through the ability to prioritise exercise, something that participants in Birtwistle *et al.* (2018) were not able to do, and failed to uptake to a scheme.

Finally, the participants discussed the ERS staff, plus the location and quality of the facilities as facilitators. The staff were viewed as facilitators as they ensured safety and provided support to exercise correctly. Various studies within Morgan *et al.* (2016) highlighted that staff support and supervision were seen as a facilitator to adherence. Taket, Crichton and Gauvin (2006) reported staff helped participants overcome barriers, in terms of motivation and providing education regarding the benefits of exercise, specific to the participant's condition. Hanson *et al.* (2019) have reported specifically how participants benefitted from ERS staff support within adherent participants. The choice of gym location was valued by participants, and the quality of the facilities were commented upon favourably. Facility quality (or lack

of) has been reported as a barrier within Morgan *et al.* (2016), whereas location choice has not been discussed within the literature.

5.10.1 Strengths and weaknesses

-Strengths

This study gained insight into the experiences of a homogenous group of participants, all of which were male and over 55 years old, a group which has previously been reported to have an increased likelihood of ERS adherence. Eynon, O'Donnell and Williams (2018) have highlighted issues with sampling variability within ERS research, which this study has overcome. The focus group was able to gain depth in, and explore the key research topic, while covering all of the research aims. This study gained new insight, particularly relating to the importance participants placed into goal setting and objective outcomes to facilitate adherence. Additionally, the study provided new insight into the importance of education and a male perception of why females may not adhere to ERS and the difficulties females may face when attending an ERS. The use of a second reviewer supported the trustworthiness of the study.

-Weaknesses

While providing insight into a homogenous group, this study does not represent the spectrum of views from ERS attendees, therefore the findings are not applicable to all ERS participants. The analysis is also subject to biases and assumptions of the researcher, however this was managed as much as possible, through reflexivity and using a second coder/reviewer (JN). Although participants discussed their perceptions about the difficulties females may face when attending ERS, ultimately, they are not views of female participants, therefore not representative of females experiences. If the focus group had included females, this could have provided more nuance, balance, clarification or indeed rejection of the male participants perceptions relating to females' experiences. Including females would have provided a wider range of experiences, from a female perspective. This could have provided insight into the barriers that adherent females had needed to overcome, or what they felt the keys to successful adherence were. This information would be valuable, in light of the data that suggests females are less likely to be adherent to ERS, in order to consider or develop strategies that could inform how to overcome barriers and support successful adherence for females. Finally, including both

adherent male and female participants, would have facilitated a more diverse discussion, relating the experiences of participants that were adherent to the ERS. Focus group interviews run the risk of containing dominant and reticent participants. Every effort was made to include more reticent participants through eye contact/directing conversation towards them, however, not all participants spoke equally. Interestingly though, the more reticent participants provided important detail and specific insights, whereas the more dominant required steering towards the key topics within focus group.

5.11 Conclusion

This study has highlighted that effort and commitment were considered as important attributes towards successful ERS completion. Routines, goal setting and measuring progress were also considered important facets to support adherence. Participants were able to recognise the benefits of exercise and this appeared to support continued adherence. It appears that developing autonomy regarding exercise and an exercise identity is associated with successful ERS adherence and continued engagement with exercise. Therefore, supporting participants to set personally meaningful goals and measurable outcomes, while highlighting the benefits of exercise may help facilitate adherence.

This study has highlighted that finance was a barrier for many participants and that the ERS provided a method of overcoming this, through subsidised exercise opportunities during and following completion of the ERS. Providing subsidised schemes and continued subsidy to access exercise facilities, appears to be an important facilitator for PA adherence in the short and longer term. Participants highlighted an inconsistent understanding of what an appropriate level of PA is, while describing a need for more educational support, particularly within regards to nutrition. Providing further nutritional support may provide participants with more options and knowledge to develop a balanced lifestyle and support PA.

Feeling uncomfortable in the gym or exercising in the presence of other gym users was described as a barrier, as was pain or physical barriers such as weight. Despite the barriers described and encountered by the participants, they were able to overcome these and complete the ERS. However, how they managed to, or the drivers behind this, were not uncovered during the study. Further investigation into this would provide valuable insight towards developing future support provided for ERS participants.

5.12 Chapter 5- study two conclusion

This chapter aimed to understand why participants dropped out of the ERS, understand what barriers were present to adherence, what the facilitators to adherence were, understand how to overcome barriers, and finally, how participants' would improve the ERS. Understanding why participants dropped out of the ERS involved investigating the views of non-adherent individuals, who shared characteristics of participants that have previously been reported to be at a higher risk of dropout (under 55's), or who have contributed to the majority of all dropouts (those dropping out within the first 6 weeks). The views of these participants, including the views of successful adherers within a focus group setting, were used to fulfil the remaining study aims.

Both groups (dropouts and adherers) identified finance as a barrier to attendance, and that limited time could also be a barrier. However, the adherent participants were more able to prioritise exercise, and were retired unlike the participants that dropped out, therefore had more opportunities to attend. Both groups of participants also identified a desire for more information/education regarding exercise, but in particular, nutritional advice. The adherent participants, although not always comfortable in the gym environment, appeared to be able to overcome this and continue to attend, contrasting those who dropped out and did not feel comfortable in the gym. However, it is not clear from this study, why some participants are able to overcome this particular barrier, and others are not. This could possibly be due to the adherent participants being able to recognise the benefits of exercise, or have developed a stronger exercise identity, however this needs further investigation.

Both groups shared a desire to be autonomous regarding their exercise, and be able to exercise in addition to, or beyond the gym setting. Participants that dropped out often failed to attain this, whereas those who completed the ERS, on the most part, were able to do so. Those who were successful, described how routine and measuring progress were seen as important, and had realistic and personal goals, with a recognition that effort and perseverance was required to achieve the goals. Although participants that dropped out described having goals, in contrast to the adherent participants, only a few appeared to be personally meaningful for them. While the participants that dropped out were receptive to the notion of being supported in measuring and tracking their progress, many did not do so during the scheme, which is in contrast to the adherent participants. Providing information on

how to do this, plus exercise and nutritional information, were key suggestions to improve the ERS by non-adherent participants.

The study uncovered specific reasons for dropout, as described by the non-adherent participants. Reasons included a lack of time, pain, not feeling listened to, feeling the ERS was not appropriate for them, expense, medication issues, and the gym environment itself. While this information was novel, the more detailed discussion by participants relating to the barriers they faced and in particular, the issues with communication provided more in-depth insight into the participant's experiences. Communication, or a breakdown in communication appeared to play a role in dropout. Participants requested more variety for exercise and as previously stated, more educational support, both of which could serve to provide more autonomy and allow participants to fit PA into their normal routines.

The ERS staff appeared to play an important role while supporting both adherent and non-adherent participants. On the most part, their input was described positively, however when this was not the case, a negative experience with staff appeared to contribute to dropout.

5.12.1 Implications for practice/future research

Both groups included within this study recommended enhancing the scheme by increasing the educational support provided for them. This would serve to improve their knowledge about exercise and provide a more autonomous approach to managing their PA. Facilitating the ability to exercise autonomously appeared to be important for adherent participants, and was lacking within the non-adherent participants. Clear and reciprocal communication, with educational support, to provide the knowledge and ability to exercise beyond the gym setting, appears to be a potential method of enhancing schemes, however the impact this may have on adherence needs to be investigated. While the adherent participants were able to overcome the barriers they described facing, it was not clear how they managed to do this, or what the drivers behind this were. Future research could investigate this, and would provide insight towards supporting participants facing similar barriers. Personally relevant goals and measuring the benefits of exercise appeared to support adherence. Therefore, supporting participants to set relevant goals and recognise the benefits of exercise appears to be an option to support adherence.

Chapter Six: Decommissioning and future alternatives

During data collection for the previous study, around March 2017, it was made clear that South Tyneside ERS was likely to be decommissioned in summer 2017. From a wider perspective, it appeared a climate of decommissioning was underway, with ERS being a target (Henderson *et al.*, 2017).

The decommissioning duly occurred, signalling the end of over 21 years of service to the community. The impending decommissioning of the scheme meant there would only be 4-5 months to implement any intervention into the existing scheme. This was insufficient to complete data analysis for the previous study, develop an evidence based intervention, apply for ethics and collect data. It was clear another option was required to complete the thesis. Following the decommissioning announcement, enquiries were made with an alternative ERS, to explore opportunities to complete the thesis. A verbal agreement was gained with an alternative local ERS in May/June 2017. However, by September 2017, this ERS was itself in danger of being decommissioned. The scheme manager placed a deadline for any research to be completed by March 2018. However, this deadline was not feasible. In the unlikely event that this could be achieved within the given deadline, the quality and academic rigour of the work would have been compromised. As analysis for the previous study had not been completed, the impact it would have on the content of the intervention would have been minimal. Additionally, there was no guarantee that the scheme would still be running in March 2018, therefore it was decided against working with the ERS.

The previous manager of the South Tyneside ERS, had taken on a new role as coordinator of the “a better u” scheme, part of which included the “Healthy Lives” fitness classes. She suggested that the Healthy Lives fitness classes could provide a workable alternative to an ERS. The Healthy Lives fitness classes were part of a community rehabilitation programme, which provided an opportunity for South Tyneside residents to exercise, and provided classes for patients that had completed cardiac rehabilitation in secondary care. South Tyneside Council was clear in terms of the replacement for the decommissioned ERS, reporting that 21 out of 23 classes had been maintained through leisure service provision, which was considered sufficient to maintain provision for the majority of residents affected by the decommissioning (South Tyneside Council, 2017). For residents that had used,

or were suitable for the ERS, no other options for supported exercise beyond the classes existed.

The Healthy Lives classes in effect, contained the remnants of the decommissioned ERS. However, they were not a scaled down version of the ERS, as there was no referral, assessment, and timeline of 12 weeks monitored attendance. A referral or assessment was not required, with no commitment to a specific programme. Participants attended ad-hoc to participate in PA and benefit from group exercise classes, delivered by the same staff and within the same facilities as the ERS.

Many of the attendees would have in the past, been referred to the ERS, but due to the decommissioning, the Healthy Lives classes were the only alternative. This was especially the case with cardiac rehabilitation. Previously, patients discharged from cardiac rehabilitation within secondary care, were directly referred into the ERS. The Healthy Lives fitness classes were therefore the only option for patients that had completed early stage cardiac rehabilitation, and were suitable for continued rehabilitation. As stated, the differences between the ERS, and the Healthy Lives classes was a lack of referral, assessment, and no tailored structure over 12 weeks. From a methodological viewpoint of the thesis, this would result in a lack of continuity between where the intervention was developed, and where it could be delivered, and was not ideal.

However, it did mean that any intervention or findings would be relevant going ahead, for the Healthy Lives classes, as opposed to being implemented into an ERS that was at risk of imminent decommissioning. Despite the differences between the Healthy Lives fitness classes and the ERS, this represented the only viable option to complete the thesis, and were therefore chosen to work with to complete the thesis.

Chapter Seven: Development and implementation of an educational pamphlet and application to practice-a mixed methods pilot trial

7.1 Aims

This study aims to utilise the findings from the previous two studies of the thesis to support physical activity (PA) adherence. The aims of this final study are to:

- Develop an educational resource for the Healthy Lives class participants, containing content informed by the previous studies in the thesis, and utilising the wider evidence base to structure and populate the educational resource.
- Assess, using a pilot trial, the potential impact the educational resource will have on (1) fitness class attendance, and (2) the levels of participant activation relating to their knowledge, skills and confidence in managing their own health and care.
- Assess the acceptability of the educational resource for the Healthy Lives participants, and refine it accordingly.

7.2 The Healthy Lives class

As discussed in chapter six, the decommissioned ERS made way for the Healthy Lives' fitness classes, which were part of the "a better U" scheme. The Healthy Lives classes provide various opportunities to increase PA levels, specifically for those who are new to exercise, or have one or more long-term conditions. The classes were located across four main leisure venues within the council run area, and were delivered by fully qualified and experienced instructors. The Healthy Lives fitness classes were based around circuit classes. 12 classes were available to attend each week. Options within the classes included badminton and specific classes were suitable for participants with a history of cardiac conditions. The Healthy Lives fitness classes aimed to help attendees feel better about themselves, manage cardiovascular disease, high blood pressure, diabetes and joint problems. The classes also aimed to help participants to manage weight and mood. The classes were held on weekdays, between 9.30-3.30, lasting approximately 1 hour.

Attendees did not require a referral, could attend ad-hoc, and were not provided an individualised exercise plan.

7.3 Influences of chapter five on the educational resource

The key findings from chapter five, highlighted that participants desired more information about nutrition and exercise to support autonomy. Participants were keen for something tangible to take away, or be able to consult in their own time, to help support their own exercise. Advice for exercise or increasing PA in an environment other than the gym was requested, and how to make the most of spare time to increase PA was a popular suggestion. The focus group data from successfully adherent participants mirrored some of these findings, notably the request for more nutritional information. This group also suggested that being able to goal set, monitor progress and develop a routine were viewed as keys to successful completion of the ERS, and continued exercise after completion of the scheme. The focus group participants were also able to identify the benefits of exercise, which was seen as a motivation to continue exercising. Despite understanding the benefits of exercise, the participants were not clear about the recommended levels of exercise that should be undertaken. This therefore identified a knowledge gap, which if filled, could help participants gauge how much exercise they should be doing.

Increasingly through the course of chapter five, as the data analysis progressed, there was an anticipation that the final study may be related to education, to support PA and nutrition. It was not until the final stages of analysis in chapter five that the specifics of what the education based intervention may contain, began to emerge. A limitation of using the findings from the previous chapters to inform the intervention for this study, was that many of the suggestions, or elements of critique were specific to the decommissioned ERS. It was important to ensure that any resource utilised as an intervention was developed and targeted to the Healthy Lives' classes, and not the decommissioned ERS. As a result, not all of the findings from chapter five could be utilised. Examples that were not suitable to apply to the Healthy Lives classes included: increasing the tailoring of exercise plans; avoiding relying on the gym as the main or only method of exercise; and increasing the assessment time slot availability.

Social media sites and pamphlets were discussed as options to convey the educational information by participants. Social media is limited by the possibility of

excluding attendees not connected to it, and using social media could compromise participant anonymity, therefore was not utilised. Pamphlets were chosen as they were more frequently requested by participants within chapter five, and there was more agreement regarding possible content, across the participants, in the context of using a pamphlet. Adopting a pamphlet as the vehicle to provide the educational information had the advantage of being easier to distribute, and was a tangible piece of information that could be taken away by the participants and used within their own time, which was requested by the participants in chapter five.

Noar et al., (2011) support the use of print based education over internet based, due to reduced cost, increased portability, and internet connection/ technical support is not required. Additionally, pamphlets have been found to have the greatest effective size in supporting behaviour change, compared to magazines or manuals (Noar, Benac and Harris, 2007). These factors supported the decision to use a pamphlet as the method of delivering the information.

By considering the findings of chapter five, and relating them to the structure and setup of the Healthy Lives fitness classes, the following parameters were set for the development of the intervention:

- Must be a printed pamphlet
- Must have information to support PA, beyond the scope of attending the Healthy Lives fitness classes.
- Must cover diet/nutritional information
- Must have a method of recording progress or development
- Must provide the opportunity for further information sourcing.

The following section provides detail on the process behind the development and design of the pamphlet, supported by the underpinning rationale and evidence.

7.4 Pamphlet development, design and theoretical underpinning

As an overall aim of this chapter (and thesis) is to support PA, it was important to consider the literature regarding behaviour change to help develop the pamphlet. The development and design of the educational pamphlet was framed around the following questions:

1. What evidence is there supporting behaviour change in terms of PA?
2. What information should be included within the pamphlet to support PA and participant knowledge?
3. How should the messages/information be framed, formatted and delivered?

4. What literature is present regarding the development/feel/look of educational material/pamphlets?
5. Are there other examples of similar pamphlets? How can they inform the development of the pamphlet?

The conclusions from the five questions were used in conjunction with the findings from chapter 5, and will be discussed towards the end of this section, where the final decisions made towards formatting the pamphlet will be presented.

1. *What evidence is there supporting behaviour change in terms of PA?*

There are various examples of interventions that have not been successful within public health, with the lack of success partly explained by limited translation of research into practice (Michie, Van Stralen and West, 2011), or because the intervention does not cover the range of possible influences on behaviour change (Michie, Van Stralen and West, 2011).

A sedentary lifestyle and the concomitant NCDs related to insufficient activity, appears to have links with behavioural as opposed to medical/physical causes (Hutchison and Johnston, 2013), suggesting that it is behaviour change which is needed to improve public health (Michie, Van Stralen and West, 2011). Many interventions to increase PA have focused on setting aside a predetermined time to attend a gym, as opposed to integrating PA into daily life, as a behaviour (Lachman *et al.*, 2018). Interventions to support behaviour change are therefore essential to prevent these NCDs (Michie and Johnston, 2012). However, efforts to support health related behaviour change, using behaviour change techniques (BCTs) has been criticised for producing small effect sizes, with heterogeneity in effectiveness when assessed with meta-analysis (Michie *et al.*, 2009). This may be due to the poorly described, specified and applied interventions using BCTs (Michie and Johnston, 2012). Reporting of BCTs, with inconsistent terminology, has been poor and has resulted in poor replicability of interventions (Michie *et al.*, 2011). Michie and Johnston (2012) suggest that precise specification and description of BCTs should be provided, including the behaviours to be changed with theory used to inform the invention design.

Originally, Abraham and Michie (2008) developed a 26 item taxonomy, which was used as the basis for the Michie *et al.* (2009) meta-regression (discussed later). Following this, Michie *et al.* (2011) published the CALO-RE (Coventry, Aberdeen, London-Reclassification) taxonomy. This work developed the 26 item taxonomy into

a 40-item version, with each item clearly labelled and defined specifically for behaviour change regarding PA and eating behaviours. The CALO-RE taxonomy has been utilised for various studies, in particular for PA increases and ERS (Olander *et al.*, 2013; Beck *et al.*, 2016). Michie *et al.* (2013) reviewed the CALO-RE taxonomy using a Delphi study, which updated and changed some of the definitions of some BCTs. For this chapter and thesis, the CALO-RE taxonomy is adopted, as it was used by Olander *et al.* (2013) and Beck *et al.* (2016), both of which focused on PA/ERS. This provided an ability to make direct comparisons to previously published work, support replicability within exercise schemes promoting PA, and provide evidenced based support for the BCTs included within this pamphlet (discussed at the end of this section below). For clarity, the difference between the 2008, 2011 and 2013 taxonomies for the BCTs which were considered for inclusion in the pamphlet are highlighted in table 7.1, most of which relate to changes in the title/definition of each BCT.

Table 7.1 Development of items within BCT taxonomy

Abraham and Michie (2008)	Michie *et al.* (2011)	Michie *et al.* (2013)
"Teach to use prompts/cues"	"Teach to use prompts/cues"	Now termed "Prompts/cues"
"Prompt intention formation"	Updated to "Prompt practice"	Now termed "Behavioural practice/rehearsal"
"Provide contingent rewards"	Updated to "Prompt rewards contingent on effort or progress towards behaviour"	Reward divided into three separate items: "Material reward", "Non-specific reward" or "Social reward"
"Prompt specific goal setting"	Updated to Goal setting (Outcomes)	Goal setting (Outcomes)
	Updated to Goal setting (Behaviour)	Goal setting (Behaviour)
"Prompt self-monitoring behaviour"	"Prompt self-monitoring behaviour"	Now termed "Self-monitoring of behaviour"
"Provide instruction"	Updated to "Provide instruction on how to perform the behaviour"	Now termed "Instruction on how to perform a behaviour"
"Provide information on consequences"	Updated to "Provide information on consequences of behaviour in general"	Now termed "Information about health consequences", which no longer differentiates between general or individual consequences.

Relating to the evidence for BCTs, Michie *et al.* (2009) conducted a meta-analysis of BCTs aimed at promoting PA and healthy eating. The meta-analysis assessed the effectiveness of individual BCTs and theoretically-derived combinations of the techniques. The technique "Self-monitoring" of behaviour was reported to be

significantly more effective than other techniques. Additionally, “Prompting of intention formation, or goal setting”, “Specifying goals in relation to contextualised actions”, “Providing feedback on performance” and “Reviewing previously set goals” were supported as effective BCTs in relation to PA and healthy eating behaviours, when included with “Self-monitoring”. Finally, Michie *et al.* (2009) concluded that increased numbers of BCTs did not increase effectiveness, possibly because introducing multiple techniques could limit the fidelity of delivery and quality of individual intervention. However, the Michie *et al.* (2009) meta-analysis used the Abraham and Michie (2008) 26 item taxonomy, not the 40 item CALO-RE taxonomy by Michie *et al.* (2011), therefore some differences in definition between each technique are extant, making the application of the findings of Michie *et al.* (2009) more difficult for this thesis.

Olander *et al.* (2013) utilised the CALO-RE taxonomy (2011) to conduct a systematic review and meta-analysis of BCTs to investigate which were the most effective at changing PA self-efficacy in obese individuals. In total, the study reported that 21 BCTs were associated with higher PA behaviour. The techniques with the greatest effect sizes were “Teach to use prompts/cues”, “Prompt practice” and “Prompt rewards contingent on effort or progress towards behaviour”.

Beck et al. (2016) conducted a review to identify which BCTs from the Michie *et al.* (2011) taxonomy were utilised within ERS consultations. Interestingly, the BCTs which had the most evidential support to include in the consultations, were some of the least utilised. For example, “Teach to use prompts/cues”, “Prompt practice” and “Prompt rewards contingent on effort or progress towards behaviour” were the three most effective techniques as reported by Olander et al. (2013), however utilised only in 9% or less of all ERS consultations, suggesting that these were underutilised.

The evidence supporting BCTs for PA promotion, provided a range of options to potentially utilise within the pamphlet. Additionally, the evidence provided a taxonomy to define and clarify each of the individual BCTs, therefore facilitating the decision making process towards selecting appropriate BCTs for the pamphlet.

2. *What information should be included within the pamphlet to support PA and participant knowledge?*

Patient education has been recognised as an integral part of rehabilitation (Hoffmann and Worrall, 2004), particularly in terms of enabling patients to make informed decisions about their healthcare and take an active role (Hoffmann and

Worrall, 2004), mirroring the views of participants within chapter five, when requesting more information about PA and nutrition.

Although the general population may acknowledge that PA is/may be beneficial (Lion *et al.*, 2018), there may be a lack of knowledge about what the benefits actually are (Dishman, 1994). A systematic review of older people's perspectives revealed in 24% of studies, a belief that exercise was not necessary or potentially harmful, with aging being a natural process that exercise could not impact (Franco *et al.*, 2015). Within the UK, only 18% of adults are aware of the recommended levels (Knox et al., 2013). Although some individuals might know the recommended activity guidelines, PA levels may be overestimated, as their perception/understanding of what moderate to vigorous activity is, may not match the definition (Knox et al., 2015). Reliance on the gym has been reported as not being conducive to participation, with alternatives to the gym being recommended (Martin and Woolf-May, 1999) for example, providing home exercise programmes has benefitted patients with knee pain (Thomas *et al.*, 2002), and written advice from a GP has helped support modest short-term PA increases (Smith *et al.*, 2000). Providing exercise information via websites has been supported for knee pain management (Brooks *et al.*, 2014), while providing internet based interventions within various behaviour change domains, to support PA, nutritional knowledge and weight management has also been supported (Wantland *et al.*, 2004).

Limited knowledge relating to nutrition, and an ability to make healthy food choices has been reported in the English population (Parmenter, Waller and Wardle, 2000), mirroring the majority of participants within chapter five, where more nutritional information was requested. Adults knowledge relating to portion size and critical nutrients (such as salt and sugar) has been reported as lacking (Mötteli *et al.*, 2016), with adults unable to accurately estimate portion size, leading to an overestimation of the appropriate portion (Almiron-Roig *et al.*, 2013). A lack of clarity about the food contents and portion size of the "5-a-day" message within the UK (Rooney *et al.*, 2017) has also been reported. Levels of knowledge regarding nutrition has links with developing healthier food habits (Worsley, 2002), highlighted by relationships between increased nutritional knowledge, and fruit and vegetable intake (Spronk *et al.*, 2014; Appleton *et al.*, 2018).

Using paper based self-monitoring and diet measurement has been supported to help manage diet and reduce weight (Burke, Wang and Sevick, 2011; Yu, Sealey-Potts and Rodriguez, 2015). The use of goal setting has evidence to support

exercise adherence if it is process driven (i.e. exercise at a certain intensity for a given time) (Wilson and Brookfield, 2009), while goal setting and self-monitoring using a tracker, have been found to be effective in reducing sedentary time in older adults (Gardiner *et al.*, 2011).

In order to support participants taking an active role in their health, improving knowledge relating to the benefits of, and the recommended amounts of PA, appear to be areas that require support, in addition to information relating to nutrition and goal setting.

3. *How should the messages/information be framed, formatted and delivered?*

A gain-frame highlights the benefits of engaging in a particular behaviour, whereas a loss-frame highlights the consequences of not engaging (Gallagher and Updegraff, 2011). A meta-analysis by Gallagher and Updegraff (2011) reported that gain framed messages were more likely to support prevention behaviours, such as PA. The authors suggested that this was because gain-framed messages may promote additional influences on behaviour other than the main message. These could include self-efficacy, social norms or outcome expectancies, with self-efficacy being a key determinant for PA. Additionally, Gallagher and Updegraff (2011) supported gain-framed messages, because they have promoted increased levels of information processing and memory (O' Keefe and Jensen, 2008) and develop behaviour effects which are exhibited over a longer period of time, which itself supports behaviour change. Using a gain-frame approach is supported by Currie, Spink and Rajendran (2000) and Winslow (2001), who suggested that negative or threatening messages (i.e. "you can as opposed to "you must") should be avoided.

Noar, Benac and Harris (2007) calculated the effect size of printed health material on health behaviour change. Messages delivered as a manual, were the largest in size (i.e. length of print), but had the lowest effect size, leading to the conclusion that the length of print will impact on the likelihood of a user reading the material. Pamphlets recorded the largest effect size, as they were more likely to retain the reader's attention. Delivering information via print, as opposed to the web, is also supported on the basis that this may provide a longer maintenance of the behaviour change that is targeted (Noar *et al.*, 2011).

However, Noar, Benac and Harris (2007) and Noar *et al.* (2011) investigated tailored health messages, this being defined as a "combination of strategies and information intended to reach one specific person, based on characteristics that are unique to

that person, related to the outcome of interest and derived from an individual assessment" (Kreuter, Strecher and Glassman, 1999). These findings therefore, should be considered with caution in the context of the pamphlet, as it cannot be considered as "tailored", but "targeted", this being the development of material that is aimed for a certain segment of the population (Kreuter and Wray, 2003). However, Kreuter and Wray (2003) suggest that even if information is not tailored for an individual, it may be a good fit for an individual, and just as effective as tailored information. This suggests that the findings from Noar, Benac and Harris (2007) and Noar *et al.* (2011) have relevance to support the development of the pamphlet.

Additionally, tailored and targeted approaches are similar as they both take information and aim to make the message more personal to the individual (Kreuter and Wray, 2003). Targeted messages can also be quite specific and it is not clear if a tailored or targeted approach is more effective or cost effective (Kreuter and Wray, 2003). It is also not clear how much individualisation and specificity is required for optimal levels of behaviour change, in either targeted or tailored interventions (Napolitano and Marcus, 2002). However, it should be considered that tailoring (or targeting) may be as important as good visual design (Kreuter *et al.*, 2000 cited by ; Noar, Benac and Harris, 2007) therefore tailoring/targeting alone is not sufficient.

Hirvonen *et al.* (2012) assessed the impact of the stage that health education is delivered, in relation to when participants are contemplating change in context of PA and exercise. Within Finnish males starting military service, the study reported that individuals who had already started exercise, were open to being provided with more information, compared to those who had not considered exercising, and more passive in their approach. Therefore the timing of delivery of the information appears to be important.

Utilising a gain-frame message, through material that does not appear to be a manual, appears to be important to support behaviour change. Ensuring that the message is targeted sufficiently to the target population, and delivered at an appropriate time, appears to impact on the effectiveness of the message.

4. *What literature is present regarding the development/feel/look of educational material/pamphlets?*

Hoffmann and Worrall (2004) provide a clinical commentary regarding the designing of effective education material within healthcare, highlighting the wide range of

factors to be considered during the design process, including: the content; language; organisation; layout and typology.

Educational information in print form, needs to be noticed, read, understood, believed and remembered (Ley, 1988), with clear objectives and purpose, which are clear to the reader (Mayeaux *et al.*, 1996; Currie, Spink and Rajendran, 2000). The writing style should be set at the lowest level of reading as possible, this provides simplicity and supports an accurate portrayal of the message intended for the reader (Hoffmann and Worrall, 2004). One idea should be expressed per sentence (Meade and Smith, 1991; Doak, Doak and Meade, 1996; Winslow, 2001), avoiding jargon (Dickinson, Raynor and Duman, 2001; Winslow, 2001), and where possible and appropriate, clarification of key terms should be provided e.g. what moderate activity is (Hoffmann and Worrall, 2004). The SMOG formula (Mc Laughlin, 1969) can be used to assess the readability of material, as it is simple to utilise and used widely within health research (Meade and Smith, 1991). Meade and Smith (1991) stated that using readability formulas is not a panacea, but should be considered when developing materials, as the reading level is only one element of development process.

The style of writing should be kept, where possible, in a conversational and active tone, while using the second person (Currie, Spink and Rajendran, 2000; Winslow, 2001). This keeps the style more interesting, maintains a lower level of reading level, facilitates reader engagement (Doak, Doak and Root, 1996; Manning, 1981; Doak, Doak and Meade, 1996; Albert and Chadwick, 1992; Boyd, 1987) and increases the ease of reading (Williams *et al.*, 2016).

Key information should be highlighted first in health education material (Boyd, 1987; Ley, 1988; Buxton, 1999), as this quickly informs the reader of the key message and helps the reader retrieve the information. Highlighting key sections with headings and where appropriate, subheadings, facilitates easy retrieval of information by the reader (Wright, 1999; Hoffmann and Worrall, 2004).

Readers of educational material often read small sections or headings (Hoffmann and Worrall, 2004), therefore key information to take away should be provided within summaries (Manning, 1981; Buxton, 1999). Using summaries helps convey information in a clear and concise manner (Boyd, 1987; Davis *et al.*, 1998; Currie, Spink and Rajendran, 2000) as it is more successful at gaining the reader's attention and supports better recollection and understanding (Dickinson, Raynor and Duman, 2001). Providing information in a logical manner helps develop an understanding

about the topic, but also makes the information useful to the reader (Currie, Spink and Rajendran, 2000). Building upon the basic principles of educational resources, through additional links/websites, to support implementation ideas and instructions has been advocated (Williams *et al.*, 2016).

Larger font size is generally preferred by readers (Currie, Spink and Rajendran, 2000; Winslow, 2001). Font type and size impacts on readability (Okuhara *et al.*, 2017), with easy to read fonts such as Arial being associated with reduced reading time and reducing the perceived effort required to do the task described in the reading material (Song and Schwarz, 2008). Using sans-serif fonts (like Arial or Calibri) may be easier for those with reading difficulties or visual impairment (AbilityNet, 2017), therefore enhancing readability (Rolandi, Cheng and Pérez-Kriz, 2011). Sans-serif fonts are also supported in terms of reading time/word recognition (Moret-Tatay and Perea, 2011), becoming the default setting of Microsoft (Moret-Tatay and Perea, 2011). However, there is no consensus regarding the type of font that should be utilised, as multiple studies have shown no significant difference between serif and sans-serif (De Lange, Esterhuizen and Beatty, 1993; Beymer, Russell and Orton, 2008).

Finally, text should aim to keep clear lines of columns where possible, maintaining a harmonious and professional appearance (Stones and Gent, 2015; Tomita, 2017), while restricting the number of colours included, to no more than three, to avoid overwhelming and distracting the reader (Stones and Gent, 2015).

While a range of information is present to support the development of health education materials, Hoffmann and Worrall (2004) concluded that more research is required to assess the effectiveness, and that patients should be involved in the design or piloting.

5. *Are there other examples of similar pamphlets? How can they inform the development of the pamphlet?*

Evidence supporting the effectiveness of, or examples of pamphlets with regards to ERS, or community fitness classes is lacking. Studies assessing the effect of pamphlets on PA generally support pamphlet use. Marcus *et al.* (2007) developed tailored print material to support PA in sedentary adults. The material was stage matched to the transtheoretical model (Prochaska and DiClemente, 1983), and utilised 14 separate contacts (using tailored pamphlets) during the course of the study, with results proving to be more favourable than those achieved with

telephone messages. This study however was not carried out within an ERS or fitness class environment. Plow *et al.* (2014) piloted customised pamphlets, also based on the stages of the transtheoretical model, for patients with multiple sclerosis to support home exercise programmes. The findings were positive towards PA increases and perceptions of physical function. Beyond the effectiveness of single pamphlets within individual studies, Vallance, Taylor and Lavallee (2008) reviewed the suitability and readability of educational print resources, related to PA, using 66 different resources. They reported that only 15% of the resources could be considered as above adequate. Nearly 40% did not state their purpose, 75% had low readability, 53% possessed inadequate subheadings supporting the amount of information presented, and 43% provided PA recommendations which were not consistent with published guidelines. Online examples of information booklets such as Exercise-Works (2011) provide a range of information, but assessment of their effectiveness is lacking in supporting PA levels.

Although there is very limited examples of material that has focused on PA or ERS, some evidence exists supporting their use. However, it appears that a large proportion of pamphlets have not been developed with the proposed recipients clearly in mind.

7.4.1 Pamphlet development and final design

The findings from each question, and the implications for the final design of the pamphlet are discussed in turn within this section.

Question one:

"What evidence is there supporting behaviour change in terms of PA?" guided what information from chapter five, could be included or enhanced within the pamphlet. It was decided that any component of the pamphlet which was linked to behaviour change, needed to be clearly specified and supported with evidence. Identifying an accepted and defined taxonomy of BCTs was used to initiate the pamphlet development process, and the Michie *et al.* (2011) CALO-RE taxonomy was adopted to do so. Michie *et al.* (2009) and Olander *et al.* (2013) identified a range of BCTs that were considered as effective in increasing PA.

However, it was clear that it would not be possible or desirable to include all within the educational pamphlet. Therefore, a review of all 21 BCTs identified in Olander *et al.* (2013) was undertaken, to understand which could be applicable to the pamphlet and which were most strongly associated with PA behaviour change.

Along with three BCTs with the greatest effect sizes (teach to use prompts/cues, prompt practice and prompt rewards contingent on effort or progress towards behaviour), five other techniques were identified as potentially suitable to support the educational pamphlet, and were supported from a statistical significance and effect size standpoint. Within the eight identified BCTs which could be included in the pamphlet, only goal setting (as an outcome or behaviour) were commonly discussed in the Beck *et al.* (2016) ERS consultations. This therefore provided an opportunity to increase the use of potentially effective BCTs within the pamphlet, which appear to have not been utilised fully within ERS consultations.

The eight techniques under consideration for inclusion to the pamphlet were compiled together (see table 7.2), and included the technique and data from Olander *et al.* (2013), with Michie *et al.* (2011) taxonomy definition. Using this table, it was possible to examine which techniques would be suitable to include within the pamphlet and how they would be included. The following section discusses each of the eight techniques, including the rationale for inclusion/exclusion, and how they were exactly included. The BCTs included within the pamphlet, were limited to seven, as evidence supporting an approach of adding as many techniques as possible was lacking (Michie *et al.*, 2009). The included techniques were well supported within the literature, but also easily applicable to a pamphlet format.

Table 7.2 Behaviour Change Techniques, Z scores, definition and pamphlet inclusion status.

Behaviour	Olander (2013) z score	Michie (2011) taxonomy definition	Included in final pamphlet?
Teach to use prompts/Cues	9.5	The person is taught to identify environmental prompts which can be used to remind them to perform the behaviour (or to perform an alternative, incompatible behaviour in the case of behaviours to be reduced). Cues could include times of day, particular contexts or technologies such as mobile phone alerts which prompt them to perform the target behaviour. NB This technique could be used independently or in conjunction with techniques 5 (goal setting - behaviour) and 7 (Action planning)	Yes
Prompt practice	9.3	Prompt the person to rehearse and repeat the behaviour or preparatory behaviours numerous times. Note this will also include parts of the behaviour e.g., refusal skills in relation to unhealthy snacks. This could be described as “building habits or routines” but is still practice so long as the person is prompted to try the behaviour (or parts of it) during the intervention or practice between intervention sessions, e.g. as “homework”.	Yes
Prompt rewards contingent on effort or progress towards behaviour	7.74	Involves the person using praise or rewards for attempts at achieving a behavioural goal. This might include efforts made towards achieving the behaviour, or progress made in preparatory steps towards the behaviour, but not merely participation in intervention. This can include self-reward. NB This technique is not reinforcement for performing the target behaviour itself, which is an instance of technique 13 (Provide rewards contingent on successful behaviour)	No

Goal setting (Outcome)	6.31	The person is encouraged to set a general goal that can be achieved by behavioural means but is not defined in terms of behaviour (e.g. to reduce blood pressure or lose/maintain weight), as opposed to a goal based on changing behaviour as such. The goal may be an expected consequence of one or more behaviours, but is not a behaviour per se (see also techniques 5 [Goal setting - behaviour] and 7 [Action planning]). This technique may co-occur with technique 5 if goals for both behaviour and other outcomes are set.	Yes
Goal setting (Behaviour)	5.31	The person is encouraged to make a behavioural resolution (e.g. take more exercise next week). This is directed towards encouraging people to decide to change or maintain change. NB This is distinguished from technique 6 (Goal setting - outcome) and 7 (Action planning) as it does not involve planning exactly how the behaviour will be done and either when or where the behaviour or action sequence will be performed. Where the text only states that goal setting was used without specifying the detail of action planning involved then this would be an example of this technique (not technique 7 [Action planning]). If the text states that 'goal setting' was used if it is not clear from the report if the goal setting was related to behaviour or to other outcomes, technique 6 should be coded. This includes sub-goals or preparatory behaviours and/or specific contexts in which the behaviour will be performed. The behaviour in this technique will be directly related to or be a necessary condition for the target behaviour (e.g. shopping for healthy eating; buying equipment for physical activity).	Yes
Prompt self-monitoring of behaviour	5.16	The person is asked to keep a record of specified behaviour/s as a method for changing behaviour. This should be an explicitly stated intervention component, as opposed to occurring as part of completing measures for research purposes. This could e.g., take the form of a diary or completing a questionnaire about their behaviour, in terms of type, frequency, duration and/or intensity.	Yes
Provide instruction on how to perform the behaviour	5.15	Involves telling the person how to perform a behaviour or preparatory behaviours, either verbally or in written form. Examples of instructions include; how to use gym equipment (without getting on and showing the participant),	Yes
Provide information on consequences of behaviour in general	3.45	Information about the relationship between the behaviour and its possible or likely consequences in the general case, usually based on epidemiological data, and not personalised for the individual	Yes

Table 7.2 continued.

-Teach to use prompts/cues

This was included due to the strength of support from the evidence, but also in response to the chapter five findings. Participants often asked for a reminder about PA. This was simple and easy to include within the pamphlet. The pamphlet suggested prompts for PA, such as setting alarms on mobile phones, keeping training attire by the door, or in the car ready to be used, and act as an additional reminder to exercise. Additional prompts such as reminders to consider doing extra exercises, for example completing squats while the kettle boils were also included.

-Prompt practice

As with the teaching to use prompts/cues, this technique was strongly supported in the literature. The key difference however, is that prompt practice relates to rehearsing and repeating either the behaviour itself or preparatory behaviours, as opposed to identifying prompts to carry out the desired behaviour. Examples within the pamphlet suggest going for a walk/jog, while waiting for food to cook, or getting off public transport (i.e. bus in the pamphlet) one stop early to walk the final aspect of the commute. By using prompts that are part of a daily routine, this provides the basis of developing a habit to increase PA.

-Prompt rewards contingent on effort or progress towards behaviour

This was not included within the pamphlet. Although supported strongly within the literature, it was not clear how this would be included within a written pamphlet. The examples provided by Michie *et al.* (2011) were not applicable to a pamphlet, therefore, could not be included.

-Goal setting (outcome and behaviour)

Both outcome and behaviour focused goal setting was included, as both types were supported by Olander *et al.* (2013) and Michie *et al.* (2009). Goal setting was clearly highlighted within chapter five as a positive behaviour for participants that had successfully completed the ERS. Advice regarding goal setting was provided within the pamphlet, including examples and space to record specific goals.

-Prompt self-monitoring of behaviour

This is supported by both Michie *et al.* (2009) and Olander *et al.* (2013), examples of which include diaries. Participants in chapter five, reported that having a tangible record of improvement or progress helped maintain their PA adherence, while those that did not complete the ERS, reported that the use of a diary would have helped support PA. They also suggested the use of a nutrition diary to support diet. Therefore, two diary trackers were provided. The diaries included diet, goals, reminders for exercise and actual time being physically active. The aim of this was to be able to highlight and repeat what was successful to support PA.

-Provide instruction on how to perform the behaviour

Advice on how to exercise, progress exercise and understand exercise was a common theme within chapter five. Participants that dropped out of the ERS

requested more information about exercise, how to do it outside of the gym and how to carry out specific exercises. Providing instruction is also supported within the literature. Within the pamphlet, this BCT was provided in various guises. Primarily, examples of PA, when and where it can be carried out to support the recommended levels are provided. Examples of calorie balanced meals, and considerations when making a balanced meal were also provided. Additionally, links to the NHS websites including detailed exercise programmes, with videos of exercise programmes and meal planners were provided. This information was included with website links as opposed to the pamphlet itself, in order to maintain a compact and manageable size of pamphlet.

-Provide information on consequences of behaviour in general

Highlighting the benefits of maintaining or increasing PA in generalised terms, was included towards the beginning of the pamphlet, as part of a gain-frame message (see question five) and this BCT highlights the consequences of the behaviour change. An example of this in the pamphlet, highlighted the benefits of PA for cardiac/pulmonary fitness. The information was not provided to an individual level, but in general terms. The 2011 taxonomy suggests that the information could be framed within epidemiological data, however specific statistics were not included within this pamphlet to avoid overloading it with data, as other sections (specifically the section regarding calories) contained numerical data.

Question two:

"What information should be included within the pamphlet to support PA and participant knowledge?" highlighted knowledge gaps within the wider population that could be addressed within the pamphlet. These gaps, and the findings from chapter five (summarised in Table 7.3) were utilised to inform the content of the information within the pamphlet.

Limited knowledge relating to nutrition was identified as an issue, in particular recommended nutrition content and portion size. Therefore, clear and simple information regarding daily, and per meal calorie intake was provided, in addition to examples of what calorie balanced meals looked like visually. The 400-600-600 calorie meal planner was included as this was part of the NHS advice. Links to web-based nutritional information were included, to provide scope for more detailed information.

Table 7.3 Overview of chapter five findings, relating to potential pamphlet content

Broad findings	Specific
Participants desired to know more information to be able to support autonomy and choice. They were not confident in the knowledge they had relating to exercise and nutrition, therefore limited in their ability to manage their own health.	Did not feel able or confident to manage health with current levels of knowledge.
Participants requested more information relating to nutrition.	Request for support with portion size, example meal plans and balanced meals.
Participants requested more information relating to exercise.	Support to exercise without needing the gym-suggestions of methods to exercise at home. Recommended levels of PA were not widely known or understood by participants
The benefits of exercise, and knowing what they are.	Understanding or recognising the benefits of PA was considered important to support continued exercise.
Support to plan and measure progress.	Goal setting, tracking and measuring progress was utilised by adherent participants and support for this requested by non-adherent participants.

A lack of knowledge about the recommended levels of PA, and what moderate or vigorous activity is was identified, in addition to a lack of clarity about the benefits of exercise. Therefore, the benefits of exercise were highlighted clearly in the first page of the pamphlet, followed by examples of light, moderate and vigorous exercise. All information provided within the pamphlet was taken from the NHS, WHO and South Tyneside council websites, to ensure that the information was correct and easy for the users of the pamphlet to find. The pamphlet contained simple examples of what exercises could be carried out, when they could be accommodated within normal/daily activities, and supported with internet links to home exercise programmes, which require no equipment or specialist facilities. As the users of the pamphlet had already made a decision to exercise, or were already engaged in PA, highlighting and "gain framing" the benefits (see details of "gain framing" within question 3) was included within the pamphlet.

Finally, a diet and exercise tracker, with simple goal setting advice was included in the pamphlet, to address the request and suggestions from participants, and was also supported within the BCT evidence.

Question three:

"How should the messages/information be framed, formatted and delivered?" influenced the pamphlet to set the overall tone as a "gain-frame". Examples within the pamphlet were "physical activity can help improve the symptoms of osteoarthritis" or "physical activity reduces the risk of stroke". The information was delivered in a size to avoid being too comprehensive and risk becoming more of a

manual instead of a pamphlet. Links to websites related to exercise and nutrition (The NHS and WHO websites, which explained PA guidelines, exercise plans and eatwell guides) were included to avoid overloading the pamphlet with information, and provide the opportunity for participants to access sources that they could confidently trust and use.

A final consideration, and justification for using the pamphlet in this study, was that the individuals within the Healthy Lives fitness classes had already volunteered to exercise and may therefore be more open to being provided with educational material to support their activity (and behaviour change).

Question four:

"What literature is present regarding the development/feel/look of educational material/pamphlets ?" was supported by the Hoffmann and Worrall (2004) clinical commentary, specifically regarding the content, language, organisation, layout and typology. The pamphlet was written at the lowest level of reading possible, with one idea per sentence and limited amounts of jargon. The SMOG formula (Mc Laughlin, 1969) was used to assess the writing level within the pamphlet. The formula ranked the pamphlet at a UK school year eleven level. This score was surprising as care had been taken to maintain clear and simple language, aiming for the recommended year seven level of readability. However, the SMOG formula is based upon the number of words with three or more syllables included within the work. The words physical, activity, exercise and vegetable were frequently used, therefore elevating the score. It was not possible to simplify these words any further, and as they are commonly used in everyday conversation, it was not viable to change this.

The key information was presented first in the pamphlet. Following the pamphlet aims, the benefits and the recommended levels of PA were highlighted. Information was then provided to help implement the knowledge into practice. Examples and methods of measuring/tracking progress, were presented for the reader to see how to use the information effectively. Much of the information included was in a bulletpoint, summary, or within a question and answer format. This was utilised to make it easier for readers to find quick answers or pertinent points to take away.

The layout of the pamphlet was framed on white space, with space between each section, and the text was a minimum of size 12 font, but was predominantly between size 16-18. Calibri, a sans-serif font was used throughout, presented within a dark colour (blue or black) to provide contrast to the white background. Although different

colours were utilised within the pamphlet, the variation was restricted to no more than three. The size of the pamphlet was limited to 10 pages to ensure that is did not become a manual, two of which were set aside to be used as PA and diet trackers

Question five:

Relating to other examples of pamphlets, there was no evidence of educational pamphlets developed in a targeted manner. However, the inadequacy of other health education resources, in terms of presenting an unclear purpose, inadequate headings or providing inaccurate information were highlighted as examples to avoid.

Pamphlet design and development: Concluding comments

The pamphlet design aimed to support fitness class attendance and improve the knowledge of participants, in areas that have been identified within chapter five, and the wider literature. This related to exercise and nutrition, where participants were not confident with, or had limited knowledge about.

Although there is an emerging and developing evidence base, supporting the use of BCTs to increase PA, there is limited evidence that this information is being put into practice. As discussed, Beck at al., (2016) investigated the use of BCTs within ERS assessment and reported that in many instances, very few of the BCTs highlighted in the Olander et al., (2013) work were applied to practice. Therefore, the pamphlet included BCTs to support PA, and also included information to improve the exercise and nutritional knowledge of participants using the pamphlet. Including this information, aimed to help address the common knowledge gap participants may have, and increase their confidence in managing their own health.

This study is original in developing an evidence based intervention, using the input of participants as the driver to develop educational content, that is framed using the support of the evidence regarding BCTs and wider evidence base. The process of applying this evidence back into practice is discussed within the next section. The final pamphlet itself, is contained within Appendix 10 and included as a hard copy in the thesis.

7.5 Implementation of an evidence based education pamphlet within Healthy Lives fitness classes: a mixed methods pilot trial evaluation.

7.6 Initial steps

A research proposal was prepared for the manager of the "a better u" programme. Following a meeting that discussed the feasibility, logistics and refinement of the proposal, verbal agreement was gained to provide the educational pamphlet to members of the Healthy Lives classes as part of a pilot trial. Ethical approval was gained on 3rd May 2018 (Ref number:9325). A working example of the pamphlet was provided to the manager and the Healthy Lives' fitness staff for suggestions and approval. Following minor changes (updating the "a better u" logo), the pamphlet was printed using a professional printing company.

7.7 Aims

The three key aims of this pilot study were to:

1. Assess the recruitment, retention and outcome measure completion of participants using the educational pamphlet and within the control group.
2. Assess if the introduction of the educational pamphlet has an impact on fitness class attendance and Patient Activation Measure (PAM) score.
3. Examine the acceptability of the educational pamphlet regarding its use, usefulness, content, and format to provide an opportunity to develop the pamphlet further.

This study will be deemed successful, if:

1. At least one third of eligible participants are willing to be randomised and recruited into the study, at least two-thirds of the recruited participants are retained within the study and complete the outcome measures.
2. There is no reduction in fitness class attendance and/or reduction in PAM score within the intervention group, or an increase in attendance and PAM score within the intervention group.
3. Participants' preferences are favourable towards the use of the educational pamphlet, in its current form, or with modification.

Note: Aims 1+2 are assessed during part one, while aim 3 is assessed within part two.

7.8 Method overview

7.9 Pilot vs. Feasibility trial

This is a pilot study with an emphasis on carrying out preliminary investigations (Whitehead, Sully and Campbell, 2014), to avoid poorly designed, resource heavy and participant burdensome RCTs (Horne *et al.*, 2018).

The use of an educational pamphlet developed for the intended population to support PA has not previously been investigated, and when designing an educational pamphlet, it is essential that is it piloted with the target audience (Hoffmann and Worrall, 2004). Additionally, the PAM questionnaire does not appear to have been utilised as an outcome measure within this specific population, environment or setting. Data regarding the numbers of potential participants using the Healthy Lives fitness classes is also limited. Therefore, in relation to the scope of this thesis, and more importantly, due to the aforementioned uncertainties about the proposed intervention and setting, conducting a full RCT would not be desirable or justifiable. It is, therefore, more appropriate to conduct a preliminary study and also include a qualitative component, as this method will aid the assessment of the intervention's acceptability (O'Cathain *et al.*, 2015). As stated in chapter three, this study will be termed as a pilot trial, as the aim is to consider if this small scale study in part, or in whole, can be upscaled. While all pilot studies may be considered as feasibility, not all feasibility studies are pilots, as they may assess the acceptability of an outcome measure (which this study does not) (Eldridge *et al.*, 2016b).

The conduct and reporting of the study will be guided by the consolidated standards of reporting trials (CONSORT) statement relating to pilot and feasibility trials (Eldridge *et al.*, 2016a).

7.9.1 Design

In order to support the aims, the study was comprised of two parts. Part 1 a quantitative study, and part 2 a qualitative study. Part 1 is a quasi-experimental trial, with two parallel groups, set within the Healthy Lives fitness class programme. One arm of the study, the intervention group, was provided with the educational pamphlet, whereas the other arm was not, serving as the control group. Part 1 lasted ten weeks, with study assessments at week zero and week ten. Part 2 consisted of a focus group interview, comprised of participants included in the intervention group, who were provided with the educational pamphlet. The Healthy Lives fitness classes are delivered across four different leisure centre locations within the South Tyneside council region. Two of the classes were randomly chosen, due to the scale and size

of the pilot, as the intervention and control groups. An overview of the study can be found within diagram 7.1 (page 193), which also provides an overview of recruitment and retention.

7.10 Part one - quasi-experimental trial

7.11 Method

7.11.1 Participants, recruitment and sample size

Inclusion/exclusion criteria

Participants were eligible for inclusion if they were members of the Healthy Lives' fitness classes and possessed an electronic swipe card (SCUBA card), which was utilised to record class attendance. No other inclusion or exclusion criteria were applied. Initially, those without an electronic swipe card were ineligible, however during recruitment, it was apparent that many of the members did not possess a swipe card. Due to a policy change, attendees were no longer required to swipe into the classes, as they could register attendance at the leisure centre reception. Therefore, many attendees did not use the SCUBA card, limiting the ability to recruit eligible participants and collect attendance data. An ethics amendment was accepted on 17th May 2018, to allow volunteers without a swipe card to be recruited (Appendix 11). This change increased recruitment numbers and increased PAM data collection. However, this limited the available SCUBA data for analysis, due to the inability to record attendance without the SCUBA card. As attendance to the classes was not the only outcome measure, it was decided that this limitation was worthwhile in order to gain more PAM data and provide the opportunity for more attendees to experience the educational pamphlet.

Recruitment

One week prior to commencing the study, a staff member delivering the Healthy Lives fitness classes, verbally informed attendees that in the subsequent class, the researcher (MK) would be present to recruit for the study. The member of staff providing this information had been informed of the study details, and provided an overview of the study. This included what was involved, in terms of completing a questionnaire and having attendance monitored- this occurred for both classes assigned to either the intervention or control groups respectively.

One week later, the researcher attended 30 minutes prior to the start of the fitness classes, made an introduction, and provided verbal details regarding the study. This

provided a clear description of what would be recorded, what the intervention would consist of, and that a second questionnaire would be completed in 10 weeks. Participants within the intervention group, were also informed that they would be invited to a focus group interview following the final data collection 10 weeks later. Participants were invited to ask questions about the study and participant information packs were provided. Once the fitness class had ended, the researcher was present to provide the opportunity for attendees to ask questions, read information sheets, and should they wish to enrol in the study, to sign consent/information forms and complete the PAM questionnaire. Participants within the intervention group, were provided with the educational pamphlet once the consent forms and PAM questionnaires were completed. Both groups were made aware if they were allocated to either the intervention or control group, and the control group was informed that they would receive the educational pamphlet once the study had been completed. One week prior to the final data collection, to provide a reminder, participants were contacted by the researcher using their preferred contact method (telephone/email).

Sample size

The study aimed to recruit a minimum of 12 participants per study arm (total of 24 participants), following the recommendations of Julious (2005) for pilot studies. Ideally, the study aimed to recruit up to 18 participants per study arm (total of 36 participants) to account for approximately 45% attrition rate, based upon studies assessing exercise adherence (Pavey *et al.*, 2012; Hanson *et al.*, 2013; Kelly *et al.*, 2016a).

7.11.2 Intervention

The intervention was an A5 Size, colour educational pamphlet, consisting of 10 pages. It was provided to the intervention group, to use for the duration of the study. The process of designing the pamphlet has previously been discussed. The content included: the aims of the pamphlet; the benefits of PA; examples of PA; tips to keep active; goal setting and dietary advice, and included an activity and diet tracker.

7.11.3 Outcome measures

Two outcome measures (one primary and one secondary) were utilised and both related to aims 1 and 2 of this study.

Primary outcome measure:

1. Fitness class attendance

Secondary outcome measure:

2. Patient Activation Measure (PAM) score

Both outcomes had the capability to generate data which could assess recruitment and retention, by calculating the number of completed outcome measures, and also assessing the impact (if any) that the educational pamphlet has on fitness class attendance and PAM score.

Fitness class attendance was assessed with the SCUBA electronic data collection system used by South Tyneside council. Members of the fitness classes swipe into sessions using a card and these data are collected by the SCUBA system. Participants with a SCUBA card provided the SCUBA number which was recorded with the PAM questionnaire. At completion of the study, the SCUBA numbers were inputted into the system and participant attendance was recorded. Primarily, attendance was calculated from the first week participants were recruited, where they completed the PAM questionnaire and provided the SCUBA number (week 0) and over the course of the following 10 weeks (week ten). Additionally, attendance to the fitness classes in the previous 6 months running up to the study was calculated, to differentiate between participants that have been longstanding attenders (>6 months attendance) or recent starters (<6 months attendance). Data from SCUBA was accessed following the completion of the study at 10 weeks. Attendance was calculated as an overall number of attendances, and an average weekly attendance to the classes, over the course of the 6 months prior to the study, and during the study period of 10 weeks.

PAM is a tool utilised to assess levels of activation individuals have, in relation to the knowledge, skills and confidence a person has in managing their own health and care (Greene and Hibbard, 2011). The tool was developed by Insignia Health, LLC, and uses a 13-point questionnaire. The questionnaire includes four Likert type scales of agreement (“Disagree strongly”, “Disagree”, “Agree”, “Agree strongly”) plus “N/A” for not applicable. The questionnaire is provided to participants in paper form to complete.

The findings are inputted into a downloaded calculator, provided with the PAM licence, and calculates a score between 0-100, which is categorised into one of four levels of activation (Hibbard and Gilburt, 2014) (See table 7.4 for descriptions for each level). Participants scoring on the lower end of the scale are typically more passive in their approach to health, whereas those on the higher end of the scale are more proactive. The PAM questions were originally selected using Rasch analysis, and each question was calibrated to a scale, indicating how much activation a respondent must exhibit to be able to endorse the item (Hibbard *et al.*, 2004). The level of activation required to endorse each question increases as the questions progress from 1 to 13. Therefore, only a small amount of activation is required to endorse the first questions, with each subsequent question requiring more activation to be endorsed (Hibbard *et al.*, 2005). The calculator takes a raw score, divides this by the number of items answered (with the exception of N/A responses), then is multiplied by 13 (Moljord *et al.*, 2015). This score is transformed into a scale with a theoretical range of 0-100, based upon calibration tables and the scores are then converted into the four activation levels (Moljord *et al.*, 2015). Questionnaires that include more than three responses with N/A are considered unreliable, and provided with a default score of 51.0 and level 2 (InsigniaHealth, 2015). While the method of developing and refining the PAM questionnaire is made clear by the developers of PAM (Hibbard *et al.*, 2005; Hibbard *et al.*, 2004), it is not clear how the cut off levels using the PAM score for each of the four levels were set. In practice, each set of PAM data was inputted within the office of the researcher. Once the data was inputted to the calculator, two scores were provided, the raw PAM score and the PAM level. South Tyneside Council owned a licence for the use of the tool, model 13UK3, specific for British population, and had intermittently used the PAM measure, but not consistently within any of the fitness classes. The manager of the fitness classes was interested in using this more consistently within the classes, and this partly informed the use of this outcome measure with the study. However, the main drive to use PAM was based upon its ease of use and the evidence supporting its application.

PAM is a validated tool (Hibbard *et al.*, 2005) and used within existing programmes throughout the NHS. Studies have supported the use of PAM to predict future health outcomes, and patient activation is a modifiable characteristic, within and out with of primary care (Hibbard *et al.*, 2007; Hibbard, Greene and Tusler, 2009; Greene and Hibbard, 2011). Greene and Hibbard (2011) reported a correlation between higher PAM scores and lower obesity, while changes in PAM have been correlated

with changes in self-management behaviours (including: engaging in regular exercise; managing stress; paying attention to amount of fat in diet; keeping a blood pressure diary; keeping a glucose diary and taking diabetes medications as recommended) (Hibbard *et al.*, 2007). Tailored coaching (based on PAM scores) has increased PAM scores and is correlated with a decrease in diastolic blood pressure and LDL cholesterol in patients with asthma, COPD, diabetes and cardiac disease (Hibbard, Greene and Tusler, 2009). When assessed over longer periods, changes in PAM scores have been associated with increases in aerobic exercise over 2 years (Harvey *et al.*, 2012). PAM changes over the course of 4 years, has correlated with improvements in self-management knowledge, health behaviours and functional health (Hibbard *et al.*, 2015), all within participants with chronic conditions. Additionally, participants that are employed and do not have a chronic health condition (though 65% were overweight or obese), higher PAM scores have been correlated with physical and mental health (Fowles *et al.*, 2009).

The PAM questionnaire, however, has not been utilised within ERS, or other exercise programmes in relation to class attendance, therefore was adopted as a secondary outcome measure.

Table 7.4 PAM Score, level and description

PAM Score	Level	Description
≤47	Level 1	Individuals tend to be passive and feel overwhelmed by managing their own health. They may not understand their role in the care process.
47.1-55.1	Level 2	Individuals may lack the knowledge and confidence to manage their health.
55.2-67	Level 3	Individuals appear to be taking action, but may still lack the confidence and skill to support their behaviours.
≥67.1	Level 4	Individuals may have adopted many of the behaviours needed to support their health, but may not be able to maintain them in the face of life stressors.

7.11.4 Additional Data collection

Participant age, gender and postcode data were collected, to provide demographic information. Postcode data were collected to calculate the Index of multiple deprivation (IMD) of the participants to assess if they represented a similar socioeconomic group as the South Tyneside population as a whole.

Participant contact details were also collected to remind them of the date of the final data collection and focus group (for participants within the intervention group).

7.11.5 Data analysis

Descriptive statistics were calculated for all data collected within part 1. PAM questionnaire scores were computed using the licensed calculator, which generated a PAM score (0-100) and a PAM level (1-4), with levels 1-4 corresponding to the PAM categorisation as seen in table 7.4.

Descriptive statistics were reported for PAM (PAM score and PAM level), fitness class attendance (mean number of attendances to fitness class mean number of attendances per week, for longstanding or recent starters, intervention and control groups, and change in attendance), age and gender. Continuous data were calculated in means and standard deviation, with categorical data calculated in raw count and percentage. Postcode data was compared against the IMD and reported descriptively. Recruitment, retention, and outcome completion were calculated using raw count and percentages.

7.12 Results

7.12.1 Participant flow

Participant flow throughout the study is contained within diagram 7.1. This includes the number of participants approached and assessed for eligibility, assigned to groups, received the intervention and were assessed for each outcome measure. Explanations for dropout and exclusions are also included.

7.12.2 Recruitment

Recruitment was initiated and completed in May 2018. Initially, the study planned for two recruitment days (one at each of the chosen fitness classes for the intervention and control groups respectively), which were preceded a week earlier by an invitation and notice that a study would be taking place. However, due to the ethics amendment to include participants that did not possess a SCUBA card, one extra recruitment day for the intervention group was required. Recruitment was conducted within May, and the study completed by July 2018 (10 weeks later). The focus group (as part of part two) was conducted on the final day of the study. On the first recruitment day, 15 out of 20 attendees in the class chosen as the intervention group expressed an interest in participating in the study. However, only seven

possessed a SCUBA card. Due to initial ethical agreement, it was not permitted to recruit attendees without a SCUBA card. The seven eligible attendees were recruited, and ethics were amended to permit the recruitment of participants without a SCUBA card.

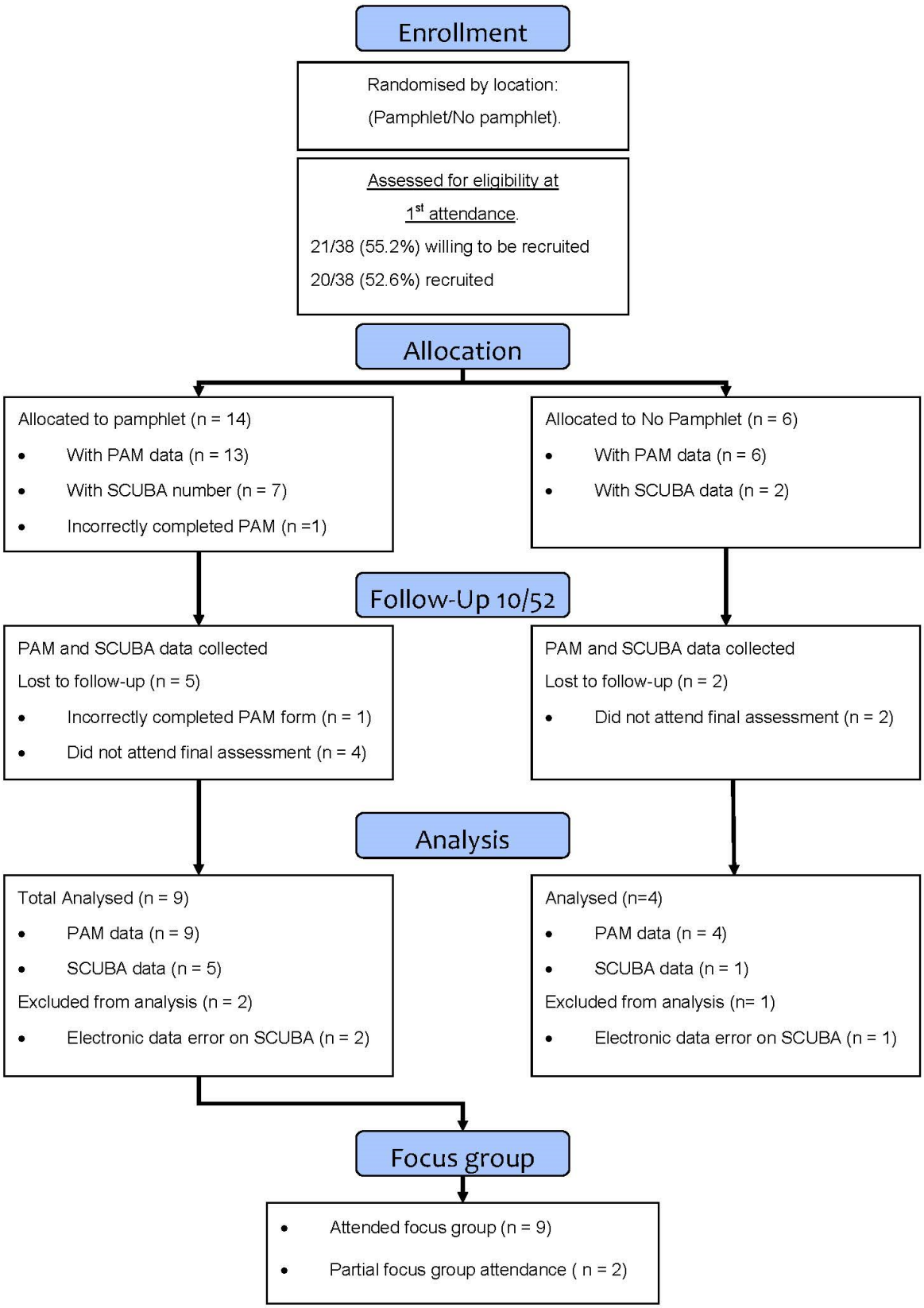
Once ethical amendments had been accepted, a second opportunity to recruit attendees from the intervention group (conducted a week following the first recruitment day) yielded another seven participants, providing a total of 13 participants. One participant completed the PAM score, but did not provide demographic information, while another incorrectly completed the PAM questionnaire and provided no SCUBA number (which could not be included in the study).

As the recruitment for the intervention group was conducted over 2 days, the exact number of potential participants is not known. Although 15 out of 20 participants expressed interest in the study on the first recruitment day, the number of participants present during the second day was not recorded, as it was not possible to record which individuals were present on one of the days, or both. The outcome of this, is an inability to calculate the percentage of participants that were recruited from those attending the class over the two intervention group recruitment days.

Participants declining to take part, cited a lack of time at the end of the class to complete the documentation or because they did not possess reading glasses to read the documents.

Within the control group, of 18 attendees, only six (33%) chose to take part in the study, with the majority of attendees declining because they did not have time to stay behind after the fitness class to complete the forms. Two of the six control group participants possessed SCUBA cards. Therefore, recruitment for the control group fell short of the required 12 participants, representing a deficit of 50%. None of the attendees who attended the control group expressed issue with being randomised into the control group, therefore randomisation into a control group was not viewed negatively. It was not possible to extend the number of recruitment days, due to the timeline constraints (discussed within the limitations).

Diagram 7.1 CONSORT diagram of study.



7.12.3 Retention

31.6% (n = 6) of all participants were lost to follow-up at 10 weeks (Intervention group n = 4 (30.8%) and control group n = 2 (33.3%)), leaving a total of 68.4% retention (n = 13). This represented 69.2 % (n = 9) retention in the intervention group, and 66.6% retention within the control group (n = 4).

7.12.4 Outcome measure completion

28 outcome measures in total were collected at baseline (9 SCUBA/19 PAM), and data for 19 (67.9%) outcome measures were retained (6 SCUBA/13 PAM). 47.4 % (9/19) of participants recruited into the study possessed a SCUBA card. Of this group, 66.7% (6/9) provided full data for attendance, equating to 31.6% (6/19) of all participants recruited (26.3% intervention n = 5, 5.3% control n = 1). Within the 13 participants completing the study, nine possessed a SCUBA card (69.2%) and provided attendance data for 6 months prior to the study. However, three sets of data for attendance during the 10 weeks of the study could not be retrieved due to a SCUBA system error.

100% (13/13: 9 Intervention/4 Control) of the participants completing the study provided full PAM datasets (i.e. pre and post data). This equates to 68.4% (13/19) data retention within the entire recruited cohort (47.4 % intervention group n = 9, 21.1% control group n = 4). Table 7.5 provides an overview of recruitment and retention.

Table 7.5 Recruitment and retention by cohort, Intervention and Control group. Any OM: Any outcome measure

Recruitment

	Cohort		Intervention		Control	
	n	% of cohort	*n*	% of cohort	*n*	% of cohort
Participants	19	-	13	68.4	6	31.6
Any OM	28	-	20	-	8	-
-PAM	19	100	13	68.4	6	31.6
-SCUBA	9	47.4	7	36.8	2	10.5

Retainment

	Cohort			Intervention			Control		
	n	% retained of recruited	% of entire cohort (/19)	n	% retained of recruited	% of entire cohort (/19)	n	% retained of recruited	% of entire cohort (/19)
Participants	13	-	68.4	9	-	47.4	4	-	21.1
Any OM	19	67.9	-	13	46.4	-	6	21.4	-
-PAM	13	68.4	68.4	9	69.2	47.4	4	66.7	21.1
-SCUBA	6	66.7	31.6	5	71.4	26.3	1	50	5.3

7.12.5 Baseline data

Demographics

Mean age of participants recruited at the start of the study was 69.6 ± 8.9 years, with the mean age within the intervention and control groups 67 ± 9.6 and 74.8 ± 4.1 respectively. Of those completing the study, the mean age was 67.9 ± 8.4. The mean age within of intervention and control groups 65.3 ± 8.8 and 73.8 ± 3.5 respectively. 13 females (eight within intervention and five within control) and five males (four within intervention and one within control) were recruited. Eight females (five intervention group, three control group) and five males (four within intervention and one within control) completed the study. One participant completed the PAM questionnaire but did not provide demographic or SCUBA details. Table 7.6 provides an overview of the participant demographics.

Index of Multiple Deprivation (IMD)

The (IMD) was calculated using the English indices of deprivation 2015 data. The postcodes provided by participants were inputted into the Ministry of Housing, Communities & Local Government resource (http://imd-by-postcode.opendatacommunities.org/) and this provided the IMD decile for each

postcode, with 1 being the most deprived and 10 the least deprived. Two of the 18 participants postcodes provided were not recognised by the IMD database.

The mean IMD decile for participants starting the study was 3.6 ± 2.7, with a mean of 3.5 ± 3.2 and 3.8 ± 1.1 within the intervention and control groups respectively. The mean IMD decile for participants completing the study was 4.2 ± 2.9, with a mean of 4.3 ± 3.5 and 4 ± 0 for the intervention and control groups respectively. In relation to the IMD of South Tyneside (3.4 ± 2.7), this highlights that those attending the classes appear to be representative of the South Tyneside population, from a socioeconomic standpoint.

Table 7.6 Demographic data at baseline and study completion. IMD: Index of Multiple Depravation decile.

Recruitment Baseline			
Parameter	Cohort	Intervention	Control
Gender (Females: Males)	13:5	8:4	5:1
Age	69.6 ± 8.9	67 ± 9.6	74.8 ± 9.6
IMD	3.6 ± 2.7	3.5 ± 3.2	3.8 ± 1.1
Study completion			
Parameter			
Gender (Females: Males)	8:5	5:4	3:1
Age	67.9 ± 8.4	65.3 ± 8.8	73.8 ± 3.5
IMD	4.2 ± 2.9	4.3 ± 3.5	4 ± 0

7.12.6 Primary outcome measures

Attendance

Of the nine participants with SCUBA data at the start of the study, seven were longstanding attendees (> 6 months), and two were recent starters (<6 months). Five out of seven participants within the intervention group were longstanding attendees, with two recent starters, while all of the control group participants (n = 2) were longstanding attendees. Three components of the SCUBA data were assessed: the attendance record in the 6 months prior to the start of the study, the attendance record for the duration of the study, and the difference between each. Within each component, the total number of attendances were calculated, with the mean number of weekly attendances. These calculations were carried out for the cohort as a whole, the longstanding and recent starters, and for the intervention and control groups, respectively. Due to a SCUBA system error, data for two participants within the intervention group and one within the control group could not be accessed. Therefore, all attendance calculations are based upon six participants

only (five intervention and one control), which severely limits the ability to interpret the findings. Table 7.7 provides a full overview of all attendance data

6 months attendance

Using the available data for the 6 months preceding the study, the mean total number of attendances for all of the cohort was 15.2 ± 12.8, equating to a mean of 0.7 ± 0.6 attendances per week. Longstanding participants' mean total attendance was 16.6 ± 13.8, equating to 0.8 ± 0.6 per week. As there were data for only one recent starter (number of attendances prior to the start of the study = 8, mean = 0.4 per week), comparison between long-term attendees and the recent starter within the entire cohort was limited.

The intervention group mean total attendances (including longstanding and recent starters) was 16.2 ± 14.1, resulting in a mean weekly attendance of 0.7 ± 0.6. As there was only one participant with attendance data for the control group (total attendances = 10, weekly mean = 0.5), comparison between intervention and control is limited. Attendance for longstanding participants was 18.3 ± 15.3 (0.8 ± 0.7 per week) within the intervention group and 10 (0.5 per week) for the single control group participant.

10 week study attendance

Across the entire cohort, including both longstanding and recent starters, the mean total number of attendances to the fitness classes was 8.3 ± 4.7, equating to 0.8 ± 0.5 attendances per week. Comparing longstanding and recent starters, revealed a mean total attendance of 9.2 ± 4.7 against 4 attendances, which equated to 0.9 ± 0.5 and 0.4 attendances per week. The intervention group mean total attendances (including longstanding and recent starters) was 9 ± 4.9 compared to 5 within the control group, resulting in a mean weekly attendance of 0.9 ± 0.5 and 0.5, respectively. Longstanding attendees' attendance was 10.3 ± 4.6 (0.5 ± 0.2 per week) within the intervention group and 5 (0.5 per week) in the control group.

Attendance change

Across the entire cohort, the mean weekly attendance increased by 0.1 ± 0.2. Longstanding attendees increased by 0.2 ± 0.3 per week, while there was no change in the recent starters (located only within the intervention group). The

intervention group (including longstanding attendees and recent starters) increased by 0.2 ± 0.3 compared to no change in the control group.

Table7.7 Attendance by cohort, Intervention & Control groups. 6/12: 6 months. 10/52: 10 weeks

	Pre					Post					
		# of att.		# p/w		# of att.		# p/w		Change	
	(*n*)	6/12		in 6/12		10/52		10/52		p/w	
Cohort		M	SD	M	SD	M	SD	M	SD	M	SD
All	6	15.2	12.8	0.7	0.6	8.3	4.7	0.8	0.5	0.1	0.2
Long	5	16.6	13.8	0.8	0.6	9.2	4.7	0.9	0.5	0.2	0.3
Recent	1	8	-	0.4	-	4	-	0.4	-	0.0	-
Intervention											
All	5	16.2	14.1	0.7	0.6	9	4.9	0.9	0.5	0.2	0.3
Long	4	18.3	15.3	0.8	0.7	10.3	4.6	1.0	0.5	0.2	0.3
Recent	1	8	-	0.4	-	4	-	0.4	-	0.0	-
Control											
All	1	10	-	0.5	-	5	-	0.5	-	0.0	-
Long	1	10	-	0.5	-	5	-	0.5	-	0.0	-
Recent	0	-	-	-	-	-	-	-	-	-	-

Patient Activation Measure (PAM)

The mean baseline PAM scores for all participants was 70.2 ± 18.6, with a mean PAM level of 3.2 ± 0.7. At baseline, the intervention group mean PAM scores were 67.2 ± 19.2, with a mean PAM level of 3 ± 0.7.The control group PAM score was 76.8 ± 17.6, and PAM level of 3.5 ± 0.6, which represented a difference in PAM score of 9.6 and a PAM level of 0.5, suggesting increased levels of patient activation within the control group at baseline.

Mean post-PAM scores for all participants was 72.5 ± 17.7, with a level of 3.3 ± 0.6. This indicated a mean PAM score improvement of 2.3 ± 4.2, and a PAM level increase of 0.2 ± 0.4 across the cohort. As a whole, this suggested that there was no change in PAM classification. However, the intervention group mean post PAM score 70.4 ± 16.9, and mean PAM level of 3.2 ± 0.7, represented a PAM score increase of 3.2 ± 4.2, and a 0.2 ± 0.4 PAM level increase during the course of the study. In contrast, the control group mean PAM score of 77.1 ± 19 with a mean level of 3.5 ± 0.6, represented only a 0.325 ± 3.9 increase in PAM score with zero change in level. Table 7.8 provides an overview of PAM scores and levels.

Table 7.8 PAM score and PAM category pre, post and change data for intervention and control groups.

	Pre				Post				Change			
	Score		Category		Score		Category		Score		Category	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Intervention	67.2	19.2	3.0	0.7	70.4	16.9	3.2	0.7	3.2	4.2	0.2	0.4
Control	76.8	17.6	3.5	0.6	77.1	19.0	3.5	0.6	0.3	3.9	0.0	0.0
Difference	9.6		0.5		6.7		0.3		-2.9		-0.2	

7.13 Discussion

The aim of part one, was to assess the recruitment, retention and outcome measure completion of participants using the educational pamphlet, while assessing if the introduction of the educational pamphlet had an impact on fitness class attendance and PAM score. The discussion is reported under the following headings as recommended by the CONSORT 2010 extension to randomised pilot and feasibility trials (Eldridge et al., 2016).

7.13.1 Limitations

A key limitation was recruitment. The study was unable to recruit the ideal total number (n = 18) of participants per study arm. The control group was unable to recruit the minimum number (n = 12) with six participants in total, although the intervention group managed to recruit 13, just above the minimum of 12. This resulted in insufficient participants, and an inability to withstand an anticipated dropout of 45%.

Recording attendance was a significant limitation within this study. Full datasets were available for analysis in only six participants, therefore, any meaningful interpretation of the attendance is difficult. This was due to the limited use of SCUBA cards by participants, which was not anticipated by the researcher, or indeed the Healthy Lives' staff. During the planning of the study, the staff were under the impression that most attendees used a SCUBA card. Additionally, the inability to retrieve three sets of SCUBA data from the electronic database compounded this problem. Assessing PA has been an ongoing issue, as studies have seldom reported PA levels robustly (Hanson *et al.*, 2013), often employing proxy measures such as attendance to assessments/consultations or self-reported measures. Pavey *et al.* (2011c) for example, reported that none of the studies within their systematic review and meta-analysis used an objective measure of PA, and all relied on self-reported measures. SCUBA offered an opportunity to provide a more objective measure of PA, by knowing exactly when a participant was physically active, for how

long and when. Theoretically, the use of an electronic swipe card, should have been a strength of this study, not a limitation. As attendance was a key outcome measure, and a key topic regarding ERS/exercise classes and this thesis as a whole, the lack of SCUBA data is one, if not the key, limitation of this study. The viability of this measure for any future studies remains debatable, unless all attendees are required to use a SCUBA card, and the reliability of the system improves. The limitation of SCUBA uncovered in this study, highlights the importance of piloting outcome measures, when considering reliability and feasibility of outcome measures (Lancaster, Dodd and Williamson, 2004).

In two instances, participants did not fully complete the appropriate documentation, one relating to the PAM questionnaire and another to the demographic information. Although not a significant issue, this did impact on the number of participants included within the study.

Despite the clear limitations of this study, there are some strengths. The study took place within a "real world" setting, therefore assessing the pilot within the appropriate context (Craig *et al.*, 2008) and the implementation of the intervention itself was simple and easy to achieve. The provision of the pamphlets took minimal time after the completion of the fitness classes. If this intervention was to be scaled up and fully implemented into the fitness classes, it would not be a difficult endeavour. The participants within the study represented the population within the local area, and clearly represented the attendees of the class as the majority of those recruited were longstanding attendees. In terms the outcome measures, the PAM questionnaire was also a strength of the study. It was simple and easy to follow, took only a limited amount of time to complete and interpret the data.

7.13.2 Generalisability

During the study, completion of the required documentation (i.e. consent forms, PAM score) was possible only after the exercise class was completed, as the introduction to the study was provided before the class commenced. If participants declined to take part, this was often because they could not stay afterwards to complete the documentation, or they did not have reading glasses and could not read the documentation. Attendees often requested the opportunity to take the documentation home and return it in the next class. This was not an option, as only one recruitment day per group was planned, which reduced the number of recruits. While a second recruitment day was conducted for the intervention group, this was planned after the first day, therefore the opportunity to offer participants the chance

to bring back the documentation a week later was lost. The process of post-data collection was considerably easier, as participants were more readily recognised before the start of the fitness class by the researcher, or they approached the researcher themselves, which resulted in the documentation being completed before the class started. Multiple attendees within the control group suggested that recruitment would have been enhanced, if the opportunity to complete the documentation was available before the class started. Although only two sets of documents submitted by participants were incorrectly completed (one PAM questionnaire and one demographic data form), this may have been explained by the participants hastily completing the forms after the class had finished. Any future trial should therefore consider providing multiple opportunities to recruit, over multiple days and consider providing the opportunity for participants to complete documentation before the start of, or after the completion of a class.

During the planning phase of the study, staff working with the fitness classes, reported that attendance was around 30-35 per class, but highlighted that this would possibly reduce during the summer holiday period. As the single recruitment day occurred during the summer, this appeared to reduce attendance. Multiple attendees reported that peers were on holiday, evidenced by the 18 attendees at the control group class. A solution to this, for a future trial, would be to either offer more recruitment opportunities, or consider the timing of the trial, to avoid conflict with the holiday period. More recruitment opportunities would provide more time for attendees to complete the documentation, and absorb more participants that were missing a class due to the summer period.

Class attendance measurement, as discussed in the limitations, was a key issue within this study. Future studies would require another method of measuring attendance, or ensuring more widespread use of the SCUBA card. This could feasibly be attained by providing SCUBA cards that are specifically linked to the study, to all participants when they are recruited. This would alleviate the issue of participants not possessing SCUBA cards and increase the SCUBA data for analysis. Pilot studies can provide valuable insight into recruitment, retention and data collection tools (Leon, Davis and Kraemer, 2011), all of which were highlighted as potential barriers to generalise the findings towards a larger study.

7.13.3 Interpretation

The aims of this part where clearly earmarked with clear and quantifiable outcomes, on which this pilot study would be deemed successful, if they were met. Each aim

will be addressed in turn, and a conclusion regarding the success of this part will be made.

This part will be deemed successful, if:

> "1. At least one third of the eligible participants are willing to be randomised and recruited into the study, at least two thirds of the participants are retained within the study and compete the outcome measures".

In the first recruitment approach, for the intervention group, 15/20 (75%) eligible participants indicated willingness to be recruited into the study, whereas only six out of 18 (33.3%) volunteered within the control group. A willingness to be recruited was not deemed to be an issue within either group and no participants verbalised any reservations or reluctance to be randomised into the control group.

However, the control group was not able to recruit the minimum expected number (6/12), leaving recruitment 50% deficient, whereas the intervention group recruited the minimum expected number (13 recruited, with an aim of 12). Although the minimum recruitment number for the control group was not met (n = 12), a third of the possible cohort was recruited. In terms of retaining participants, the study was successful, as 68.4 % (i.e. over two thirds) of the cohort were retained (69.2% and 66.6% within the intervention and control groups, respectively).

Data for outcome measure retention was mixed, PAM data collection and retention was far more successful compared to SCUBA attendance data. 68.4% (13 out of 19) of PAM data were retained for analysis, with 100% (13/13) of participants completing the trial providing full PAM data. Contrasting this, 47.4 % (9/19) of participants recruited into the study possessed a SCUBA card. Within the 13 participants completing the study, nine possessed a SCUBA card (69.2%). Of this group, 66.6% (6/9) provided full data for attendance, equating to 31.6% (6/19) of all participants recruited. Taking all outcome measures as one, 19/28 possible data were retained (13/19 PAM, 6/9 SCUBA), meaning 67.9% of all outcome measures were retained.

> "2. There is no reduction in fitness class attendance and/or reduction in PAM score within the intervention group, or an increase in attendance and PAM score within the intervention group".

Data on class attendance using the SCUBA system were very limited, making interpretation difficult. However, the available data indicated that there was no reduction in the class attendance within the intervention group, with a very minimal

increase in average weekly attendance, compared to no change within the control group.

PAM data was more plentiful, and was able to provide more insight. Initially the control group recorded higher PAM scores, suggesting increased levels of patient activation at baseline, though this should be interpreted with caution, due to the relatively high standard deviations. Despite the differences in baseline scores, both the control and intervention groups PAM scores increased, with the intervention group making a greater increase compared to the control group, using both PAM score and PAM category measures. Table 7.9 provides an overview of the aims and results of the pilot study within part one.

Table 7.9 Pilot study parameters aims and results.

Level	Parameter	Aim	Result
Recruitment	Randomisation willingness, %	33% of eligible participants willing to be randomised.	100%
	Recruited, *n,* %	33% of eligible participants willing to be recruited (min *n* = 12 per arm).	*n* = 21/38 (55.2%) willing. 19 recruited (50%), (13 intervention, 6 control.)
Retention	Retained, *n,* %	66% of participants retained	*n* = 13/19 (68.4%) retained
	Outcome measure, *n*, %	66% of OM's retained	19/28 data retained (67.9%)
Outcome measures	Attendance p/w	No reduction, or an increase in attendance within intervention group.	No reduction, with 0.3 mean attendance increase p/w.
	PAM score/category	No reduction, or an increase in attendance within intervention group.	No reduction, with mean increase of 3.2 PAM score, and 0.2 in PAM category.

7.14 Part one conclusion

Despite recruitment limitations, the use of the educational pamphlet appears to show some promise. Attendance was observed to increase in the intervention group, albeit a very small increase, within a very small cohort. PAM scores increased in favour of the intervention group, based upon a larger dataset. The use of SCUBA to measure attendance has potential to be viable, however in this pilot, it was not successful as insufficient participants used SCUBA cards, and data retrieval was limited by electronic errors within the SCUBA system.

In contrast, PAM appears to be a viable outcome measure, as it was simple and easy to collect data, and provides insight into the participant beyond attendance frequency alone.

This pilot exposed two key limitations that would need to be rectified if this study is to be considered for expansion in the future. Primarily, recruitment was a significant limitation, and could be rectified by increasing the number of recruitment opportunities for interested individuals to participate. Secondly, overcoming the limited use of SCUBA cards, and the electronic issues relating to data retrieval, should be rectified to accurately measure attendance.

Using the aims and criteria set to appraise this pilot, it appears there would be justification to develop this study into a larger scale to assess the pamphlet within the exercise classes, if the main limitations could be overcome, as decisions to move from a pilot to a larger trial should be based on feasibility objectives (El-Kotob and Giangregorio, 2018).

However, this first part relates to the quantitative assessment only, and does not consider the qualitative component. The second part which follows, provides a qualitative assessment of the pilot.

7.15 Part two- qualitative study

7.15.1 Aim

To examine the acceptability of the educational pamphlet within the Healthy Lives fitness classes.

17.16 Method

17.16.1 Design and sampling

A semi-structured focus group was employed. This provided opportunity for flexibility and scope to investigate emerging themes, or develop insight into viewpoints that may not have previously been anticipated. Focus groups are appropriate to gain views from participants that share a common experience (Finch, Lewis and Turley, 2014; Green *et al.*, 2015), and therefore, deemed more appropriate than individual interviews, as the participants shared a similar experience of being exposed to the pamphlet. A focus group also provided the benefit of collecting the data in one instance, with a group of participants that experienced the same fitness class. Purposeful sampling was utilised to ensure that all of the participants had been exposed to the pamphlet and could therefore provide insight that could support the research aim.

17.16.2 Participants and recruitment

Inclusion/exclusion criteria

Participants were eligible for inclusion if they had completed the 10 weeks of the study, and had been allocated the educational pamphlet. Participants were excluded if they were not recruited as part of the intervention group.

Sample size and Recruitment

The study aimed to recruit 6-8 participants for the focus group. This was based upon the recommendations of (Ritchie *et al.*, 2014a), as this size suits groups that are engaged, and increases the ease of gaining deeper and richer data.

During part one, the researcher contacted participants one week prior to the final PAM data collection. Participants were also invited to a focus group once the fitness class had been completed, following completion of the final PAM questionnaire. Prior to the start of the final fitness class, participants were reminded of the opportunity to partake in the focus group to provide feedback regarding the educational pamphlet. Participants were instructed to remain in the fitness class

once it had been completed, if they wished to take part in the focus group. The focus group was conducted in July 2018. The duration of the focus group was 30 minutes and 28 seconds and began with nine participants (6 females, 3 males), however two female participants left 5 minutes before the completion of the interview.

7.16.3 Focus group interview guide

The guide was developed to help provide structure, and also allow the flow of natural conversation. The guide was developed to support the aims of the study, in particular the acceptability of the educational pamphlet, in terms of content, design, usability and to gain an overview what could be done to improve the resource. The topic guide utilised is presented in box 7.1

Box 7.1 Focus group interview guide

Intro and aims
What were your initial thoughts on the pamphlet?
Did you read the pamphlet?
Did you use the pamphlet?
What parts?
Prompts?
1. Goal setting?
2. Nutritional tracker?
3. Exercise tracker?
4. Website links?

If so, were they of any benefit?
Did you learn anything from the pamphlet?
What did you like about the pamphlet?
What did you not like about it?
What would you add?
What would you remove?
Do you think it is a useful addition on the whole?
Wind down
Anything else to add, what the data will be used for.

7.16.4 Equipment and audio recording

The focus group interview was audio recorded using two digital voice recorders (Olympus digital voice recorder model DS-40 and Philips digital recorder model LFH0612). This provided backup and two sources of data to help limit any inaudible data. The audio recordings were transcribed verbatim by the researcher. Any details or information discussed during the focus group that could make participants or health professionals identifiable were not transcribed, and replaced with a blank to ensure full confidentiality.

7.16.5 Data Analysis

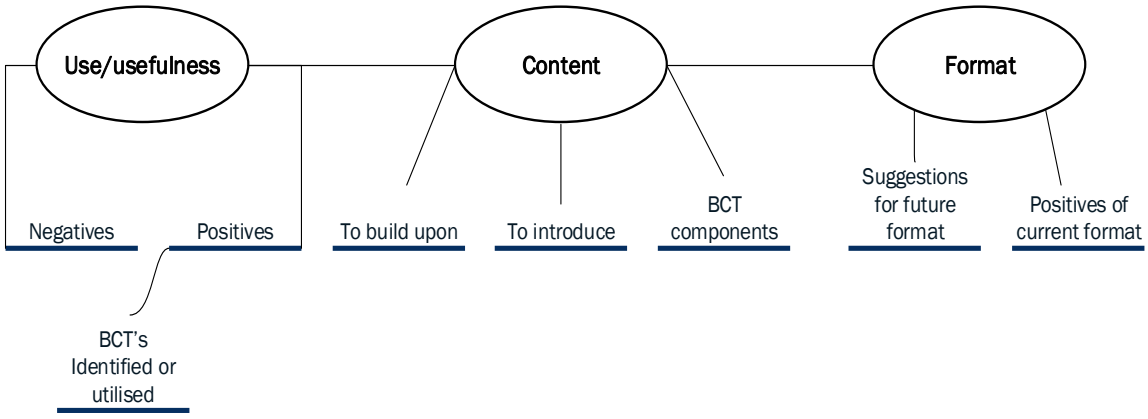
As stated in chapter three, the data generated within this part of the study was analysed using framework analysis, following the same process described by Gale *et al.* (2013) and utilised for the focus groups in chapter five. The only exception to this, was the researcher (MK) coding alone and used "open coding", in order to include as many perspectives as possible (Gale *et al.*, 2013).

The audio recordings were transcribed primarily using data from the Olympus digital voice recorder model DS-40, due to the higher audio quality. However, in any instances whereby clarification of the data was sought, the Philips digital recorder data were consulted. Following the transcription of the data, a second review of the transcription was cross-referenced with the audio data to ensure transcription accuracy, and analysis was carried out using NVivo (Version 11, QSR International).

7.17 Findings

Following the framework analysis, three key themes were identified (Diagram 7.2). All had clear links to the research aims and were associated with each other, in terms of examining the acceptability of the pamphlet regarding its use, usefulness, content and format. Each of the themes, namely "use/usefulness, "Content", and "Format" and are discussed below.

Diagram 7.2 Key categories and subthemes developed within framework analysis. BCT: Behaviour Change Technique



7.17.1 Use/usefulness

This theme related to the use of the pamphlet by the participants and their engagement with it. Participants explained if they used the pamphlet, but also discussed how they used it and applied the information into practice. All participants, with the exception of one, reported reading the pamphlet as a minimum level of engagement.

-Positives

The levels of engagement across those who read it varied, however within the group the pamphlet was viewed positively, and was seen as something that could be provided to future participants:

> *I: "on the whole do you think that it's a positive thing to have this?*
> *Group: Yes.*
> *P#6: I think it is very good.*
> *P#4/5: yes.*
> *I: so, if that was given to everyone that came in as soon as they started this class, that would be…*
> *P#6: I think you could yea…*

The participants discussed various components of the pamphlet positively. Three components were recognised and discussed by the participants as they were often used, and perceived to be useful. Each of these components were included in the pamphlet using the evidence regarding BCTs and the findings from chapter five. The three components were the nutritional information section, activity tracker, and the weblinks, which related to the "Provide instruction on how to perform behaviour" and "Prompt self-monitoring of behaviour" BCTs. The nutritional information section was portrayed positively, particularly because it provided information that was novel to the participants:

> *P#3: "the 400-600-600 was good. That's about the best that I got out of the pamphlet…*
> *P#3: I've never heard about that before."*

Information regarding calories, and calorie counting was positively received, and seen as a useful addition to the pamphlet. However, more information to illustrate what a specific number of calories would look like on a plate was requested:

> *P#4: I thought the calorie part was really useful. I would have liked to have seen more examples of what 400 calories… more idea of what…*
> *I: what they look like?*
> *P#4: yea.*

Both trackers that were included (nutritional and PA) were discussed. The PA tracker was discussed in more detail compared to the nutritional tracker, and was utilised more by the participants. While the nutritional tracker was not as well received as the PA one, the concept of using a tracker per se, and the recognition that it could be useful was:

> *P#6: "being a pedantic type of person, if I wasn't diabetic, I would probably use that as well [diet tracker], because I like formatting my life. But I do think some people, you don't always appreciate it, until you actually fill it in. And it does help you remember things."*

The activity tracker was utilised and its benefits described in terms of supporting goalsetting, and used to support PA, when fitness class attendance was not possible. The inclusion of the tracker was intended to help record PA, and was used by the participants in this manner. The tracker could also help highlight progress that was made by the participants. However, an unintended benefit and use of the tracker, was that it could be used to record, but also schedule, or recognise when there were opportunities to fit in PA:

> *P#6: I like the activity tracker, I'm that type of person, I like the idea of setting yourself a goal. Especially when you have been poorly…*
> *…P#6: See I work three days, so I'm off on a Tuesday and Thursday because of health. So, all of my hospital appointments tend to come on Tuesdays and Thursdays now over the years. So what I do, actually after work, on Monday came swimming. But I had to put myself in different…its just actually watching that and seeing that… its showed me that I can actually do a little bit more [PA]*

The weblinks included within the pamphlet were used by various participants. The links relating specifically to the exercise programmes, which included a progressive exercise video plan were used by multiple participants, as well as the links regarding nutrition. Two participants particularly engaged with one of the weblinks, an NHS link providing exercise plans for up to 8-9 weeks. Unfortunately, the link did not include all of the promoted content, so the participants could not follow all 8/9 weeks of exercise. Despite this, the participants did initially engage and made the reasons for doing so clear:

> *P#7: there is a page where it says, if you are ever busy, it help you do to other stuff, if you cant come to the class. There is the NHS class, see the NHS aerobics exercises class video online… its not working….*
> *its working for the first week, the second week, and then for reasons that I cant explain, it doesn't want to get to the third [week] because it is supposed to be 8 or 9 weeks….*
> *P#6: I had those same problems myself.*
> *P#7: it didn't work?*
> *P#6: because that was going to be my option for not doing anything else when I was in the hospitals. It was my husband, my husband he turned around and said I have set you up on this [NHS weblink] and you can exercise.*
> *P#7: same thing with me*

While the reasons for using the nutritional link were not discussed, they were used by one participant who appreciated that the website could calculate calorie expenditure from PA.

-Negatives

Participant 1 was the only participant that did not read the pamphlet. She stated that this was because she needed a lot of help, however did not elaborate further on

this. She did, however, highlight a potential barrier, or flaw when including websites into the pamphlet, where she felt that not all participants have access to the internet.

7.17.2 Content

This theme related to the content included in the pamphlet, but also covered what content the participants felt could be developed or increased in future versions of the pamphlet. This theme represented the most voluminous data generated in the focus group, which appeared to be because the participants were keen to provide suggestions to further develop the pamphlet. This theme consisted of three subthemes, including suggestions to build upon what was already in the pamphlet, what new content could be introduced, and finally, discussion about components of the pamphlet that were included as BCTs.

-Content to build upon

This subtheme covers content that was viewed positively and where participants requested more information on the topic. As discussed in the use/usefulness theme, the nutritional information was a successful inclusion for the pamphlet. However, participants were keen to have more information on this subject, because they felt there was a need for more clarity about what a certain number of calories would look like on a plate. They suggested providing visual examples of what a meal containing a certain number of calories would look like. Additionally, an explanation using the traffic light system used on food products proved to be a popular suggestion, as some participants admitted to having no idea what calories would equate to on a plate:

> *P#6: the 600 calorie lunch is a good thing, if you can show what 600 looks like. Because some people think, well a bowl of porridge is 400, what's 600? You know what I mean? And you don't always… do you?*
> *Unidentified person: I have no idea.*
> *P#6: if you put your pasta on, and that's a big bowl,*
> *P#4: yeaa*
> *P#6: for 600 calories. And that will show you…what 400 is, to what 600 is. Because… people…can look…ahh*
> *P#6: you could even mention about that coding [on labels].*
> *P#4: yea.*
> *P#6: on the pamphlet, you know the green… traffic lights system, you could even put that somewhere, somewhere on that page, just a little one. A little assistance there. Just to get people... because… some people don't know, what them things stand for on a back of [product].*

Information about PA, and the promotion of PA was also seen as a positive aspect of the pamphlet. Participants were keen to have more information about PA, so they

could apply the concept themselves, in order to provide some progression beyond the fitness classes...

> *P#2: because we…I don't know about you's, were referred here, from the hospital. I think 10 weeks at the hospital, then [fitness instructor] used to take us at the hospital, then come to [leisure centre]. But its never… the actual exercises, I think as you get fitter…I think the exercises need to be stepped up to get your heart going.*
> *I: so, do you think, with part of the pamphlet, we try to look at ways to progress things a little bit?*
> *P#2: yes I think so*
> *I: if we could get a bit more information around that [progression] do you think that would be of benefit?*
> *P#2: yes*
> *I: because, what I think… its hard to progress a whole class as one, as there are lots of levels*
> *Group: in agreement*

Part of the participants' rationale for requesting more information was to help support themselves, linked with being able to individualise their PA. One participant, while reflecting on the experience he had with cardiac rehabilitation prior to attending the fitness classes, discussed how he was provided with guidance around heart rate training zones. He felt this helped the exercise become more individualised, and was something he felt could be included in the pamphlet.

The final component regarding the request for more specific content, linked with some of the suggestions that the participants wanted to add in future iterations of the pamphlet. While the pamphlet promoted the benefits of PA, the participants felt that this could have been emphasised more:

> *P#3: that is something that should be emphasised as aswell, in my case... I was in really quite a bad way when I started to get my heart problems. And I just thought it was old age setting in. And, I have a heart problem, where the blood isn't circulating around my lungs… fast enough. So the rest of the body is constantly saying "please send me some oxygenated blood" so you are always feeling tired. And this knocked on to lots of other things, I couldn't… my memory was going, my orientation was going… I couldn't write down 4 numbers, I couldn't read 4 number and write… copy them down. They were gone, I would get the first two, then I would go "ah, ill have to look" get the second two. And since I have been doing these classes, from the hospital and then here, all of that has disappeared! I am much much fitter, as you can see hahaha*
> *Group: muffled agreement.*

-Content to introduce:

This subtheme covers content that was not included within the pamphlet, but the participants felt could be within future iterations. Increasing the emphasis on the benefits of exercise was a suggestion that the group came to a consensus with. To

support this, a suggestion was to add case studies of participants who had benefited from attending the classes. Promoting and celebrating the positive experiences of people engaging in PA and attending the fitness classes was strongly supported. Using these examples served various purposes, one of which was to provide a more authentic voice promoting the health benefits "*But if you can give examples, you know and, prove to people that it really does work" (P#6)".* Doing this would also facilitate avoiding the use of stock sentences or generic facts about the benefits of exercise, which was highlighted as something people may believe less, compared to a person's experience. Using the case studies to celebrate success would also serve to support people making the first step towards a healthier lifestyle. The following exert highlights how a case study would provide authenticity to the messages in the pamphlet. It also guides how the participants felt it could be achieved by celebrating how the case would not have to be based on an example of extreme success. Making a change by attending the fitness classes was a cause to be celebrated in its own right:

> *P#6: not necessarily a success…somebody who comes, who is going to continue coming… its just, the initial hurdle person as well.*
> *P#4: yea*
> *P#6: you have got your success person, someone who found it hard, to socialise, and then found it different when they actually started… which helps… if you enjoy it…you will join in. If you don't enjoy, you will start to lag behind people, and then you don't come back, like you said before. So I think you could have like… different types of… scenarios…*
> *P#6: not just the one where "im brilliant, im fantastic… I can run a marathon now" because none of us are going to run marathons. Well not this year anyway. You know but, something like that, where you have got your beginner, your middle of the road, then the one who really enjoys it and who has come to just like get their fitness levels up.*
> *I: so I think its like having a real story, its not like somebody who…*
> *P#4: somebody who has turned a corner*
> *P#6: turned a corner yea! Walked in that door, it's a big step walking in the door*
> *P#1: once you get through that door…*
> *I: so that's the big focus on… that initial change… and getting through*
> *P#4: yes*

The rationale supporting the inclusion of success stories, was not based solely on providing authenticity to the pamphlet messages. The benefits surrounding the social aspect of attendance, and the inclusivity of the classes were also felt to be important to celebrate and promote. The participants felt that it was important to highlight the varied demographics of the exercise class attendees. This could be achieved through the success stories which would support de-bunking myths or negative perceptions about the gym environment, and promote the image of a

welcoming and inclusive class. The following exert, while slightly extended, provides insight into the importance of celebrating the inclusivity of the classes and the perceptions participants may have had prior to attending:

P#9: and they could mentioned something about the social type aspect
P#6: I was getting to that
P#9: getting people out of the house, and mixing with other groups. There might be some people don't go out very much.
P#2: see as you get older you lose your confidence. Being honest, it has been [the scheme] a revelation.
P#3: people are frightened to come to the gym and things, because they expect to see all of these Adonis all over the place.
P#3: doing all sorts of stuff you know. And I have, the number of people I have talked to and said, you know... I mean I go into the gym, the other 3 days per week, and I was always, expecting to see all these, people, pumping iron…. And its people like us… in there!
Group: muffled laughter
P#6: I think you should have a section about socialisation for different people, you walk in and you don't know a soul, so the nicest thing about there (the class)… the first time I walked in to there, 3 people came over immediately and says hello, what's your name and that wasn't…[the instructors name]… that was 3
P#3: I think its quite remarkable this group, I don't think you find many groups like this. Its really friendly
Group: agrees.

Of all the topics discussed by the participants, the suggestion to add a picture of the class and its attendees was the most clearly agreed upon, and strongly supported as an option for the pamphlet. The participants felt strongly that the inclusivity of the class should be celebrated, to encourage people to attend and not feel put off from attending. Placing the picture front and centre of the pamphlet was seen to be the most appropriate location within the pamphlet. The reasons for doing so were made clear by the group:

P#7: yea [in agreement with P4], with all kinds of people, so they people can see…., ah well look…you know…
P#6: if you have a look at that class, its all different ages.
P#3: that's good you know… because, you can immediately see, what sort of people are going. And it stops any fear.
P#7: yea., yea
P#6: the thing is, if you have been in lately in there, have you noticed the picture on the wall… none of us will be jumping….
Group: Laughter [as picture outside gym apparently has well defined/muscular individuals on]
P#6: like if we thought we were going to one of them classes, we wouldn't walk through that door, would we?
P#4: nah.
P#6: you know, so, a picture might….
P#7: yea
P#6: because…
I: I love that idea

P#6: because there is a lot of diversity within the group, shapes, sizes, ages… whatever, you know what I mean.
P#6: no I think that is a really good idea.

However, some concepts included within the pamphlet did not appear to warrant any more expansion. Providing more detail about the class, such as the types of exercises included, or adding a list of other activities in the leisure centre was viewed as providing too much information and risked overburdening the pamphlet.

-Behaviour Change Techniques (BCTs) components

Various components of the pamphlet were included as BCTs with the aim of supporting PA. Examples of participants directly utilising components of the pamphlet, that were included as BCTs, have been discussed in the use/usefulness theme ("Provide instruction on how to perform behaviour" and "Prompt self-monitoring of behaviour") in relation to providing more information about PA and calorie counting and using the PA tracker.

Promoting the benefits of PA (based on the BCT "providing information on the consequences of behaviour") was recognised in the pamphlet by participants, as something to build upon in future pamphlet iterations, as they wanted more benefits to be highlighted, including the physical and social benefits of attending classes. However, not all components of the pamphlet included as BCTs were utilised by participants. Some were discussed and recognised by the participants, often because they already employed them before being provided with the pamphlet. For example, participant 6 recognised the benefit of the nutrition tracker, but didn't use it, as she already tracked her diet to manage her diabetes. She described a similar recognition of goal setting, which was a technique she had employed following Physiotherapy, and felt it helped her. This finding provides some insight into the notion that the BCTs included within the pamphlet were appropriate, although not new, because some of the participants already employed them, and were regular attendees to the fitness classes.

7.17.3 Format

Participants provided feedback about the format of the pamphlet. The feedback came in two forms, the first relating to the positives of the format, and the second regarding how the format of the pamphlet could be enhanced.

-Current format

The format of the pamphlet was commented on favourably, and suggestions of where to provide the pamphlet was also discussed by participants. When designing the pamphlet, a key principle was to ensure that pamphlet was not too large or unwieldly. The size of the pamphlet was commented on in positive terms by numerous participants and they recognised the importance of striking a balance in terms of the length/size of the pamphlet. They also liked how further information could be provided, if participants wanted it, through the links made with various websites included in the pamphlet:

P#7: it was… I loved the format.
I:in terms of the size?
P#6: the size
P#7: the size
P#5: its good
P#7: not too many pages…yea
P#6: it's a flappable things, isn't it.
I: yea I think that is something, we were aiming for. I didn't want to go away from just a sheet that is easy to lose, or… a textbook
P#7: yea
I: that you are going to get lost in, or too heavy to carry… you know… so
P#5: you can get a rough idea, with that in 10 minutes
P#7: yea
P#5: whereas…
P#3: you can refer out to other information…
I: yea, hence with the websites
P#3: if you want, more information is available…

The language used within the pamphlet was also assessed to ensure that the message was clear, and used the simplest terminology where possible to support message clarity. The simplicity which aims to support understanding was picked up upon and discussed:

P#6: I think that the language in it (the educational pamphlet) is really good as well, it is very…
P#7: easy to understand
P#6: it is very understandable
I: so was there any parts of the pamphlet that you didn't understand? Or you think needs more clarification?
P#3: Not really no.

-Future format

Participants also discussed how the format could be amended in the future, by how it was supported. Participant 1 felt that there could be difficulties with the weblinks, as some users may struggle with computer literacy. Therefore a suggestion was made that users could be directed to the local library to gain access to the internet,

including support to use the computers should they wish. While this was a suggestion relating to how the format of using some weblinks could be supported, it was not felt that the format itself needed to be changed.

7.18 Discussion

The focus group provided insight into the participants' views regarding the pamphlet. The pamphlet was viewed very favourably and unanimously seen as a positive additional resource. All participants with the exception of one read the pamphlet, and the engagement levels varied amongst those that did read it. The nutritional information, tracker and weblinks relating to PA were the most commonly used sections of the pamphlet. The nutritional knowledge was especially well received, as participants reported learning new information from this section.

Portion size knowledge in laypeople has been reported as being limited (Mötteli *et al.*, 2016), which was apparent within this current study, as the information about portion size was appreciated, but more was needed for a fuller understanding. The inclusion of the nutritional information and links to the PA information were primarily in response to the findings from chapter five. Participants in the chapter five focus group were all male, and the participants in this current study were from the lowest 3 deciles of the IMD. These groups (males and low IMD) have been reported to have lower levels of nutritional knowledge (Parmenter, Waller and Wardle, 2000) with low health literacy related to poor health outcomes (Spronk *et al.*, 2014). The traffic light system for nutrition was suggested to be included in future pamphlet iterations, due to a perception that nutritional information found on food packing was difficult to interpret alone. Interestingly, older UK adults, from a lower social class (the demographics of the focus group), have been found to have more difficulty interpreting food labels, and the traffic light system is a preferred method of supporting nutritional information comprehension (Malam *et al.*, 2009). It is, therefore, possible that the participants in this study possessed less nutritional knowledge, and therefore, more likely to want or appreciate the additional information.

Providing information to support exercise beyond the gym setting was cited within chapter five as a suggestion to improve the ERS. This was a key underpinning reason for the weblinks inclusion in pamphlet, with a reliance on the gym setting for exercise being reported as less desirable (Morgan *et al.*, 2016) and was a method of supporting autonomy. The weblinks to support PA were also well received.

Individuals that have embarked on exercise, have been reported to be more open to further educational information (Hirvonen *et al.*, 2012), which could have been the case within this study. The weblinks were also popular because they could support exercise when attendance to the classes was not possible.

The participants felt the pamphlet should promote the benefits of PA more, and felt that celebrating the inclusivity and social benefits of attending the classes should be more prominent within the pamphlet. They felt this could be achieved by using real life case studies of class attendees as a vehicle to do so, while providing authenticity to the message. Participants recognised that taking the first step through the door into the classes was important, and the pamphlet could support this.

The participants wanted to debunk the perception that the gym or the classes are attended exclusively by aesthetically attractive fit young individuals. While it is possible that this perception was a barrier that the participants had previously needed to overcome themselves, it was clear that the participants felt it was an issue that needed to be addressed to support attendance. The perception that the gym is populated exclusively by fit aesthetically attractive young individuals, which can be an intimidating prospect, was also highlighted by participants in chapter five, and has been previously reported as a barrier to activity/exercise (Martin and Woolf-May, 1999; Morgan *et al.*, 2016).

The format of the pamphlet was positively reviewed, particularly the size and language, which was formatted using the recommendations of Hoffmann and Worrall (2004), indicating that the pamphlet was appropriately formatted and effectively understood.

The inclusion of the trackers was also appreciated, but not as frequently used as the nutritional information or weblinks. The trackers were included due to the chapter five findings, and supported with the BCT literature, relating to “Prompt self-monitoring of behaviour”. It is not clear why they were less popular, but being attached to the pamphlet, could have been a barrier, while “Prompt self-monitoring of behaviour” as a BCT was one of the less strongly supported techniques included within the pamphlet.

The use of weblinks was questioned by one participant, in case users were not connected to the internet or computer literate. The pamphlet was chosen as a method of providing information instead of the internet, to avoid computer literacy or connection barriers. However, as highlighted by the incomplete information provided by the NHS weblink, web based health information not only requires an ability to understand and appraise information, but requires an ability to seek and find it first

(Norman and Skinner, 2006). Therefore, it appears that the use of a pamphlet in this study was justified.

7.18.1 Strengths and Weaknesses of the study

-Strengths

This study was able to gain insight from users of the pamphlet, directly following engagement with the Healthy Lives classes for a period of 10 weeks. Conducting the focus group at the completion of the quantitative study, provided the opportunity for participants to provide timely feedback regarding the pamphlet, therefore avoiding issues such as recall bias (Althubaiti, 2016). The focus group gained the views of males and females, and was able to address the research aims. Including a qualitative part within a pilot study can provide insight into how components and delivery of an intervention work within the real world (O'Cathain *et al.*, 2015). In this study, feedback on each component of the pamphlet, and how it was used was provided, therefore providing insight into how to improve the pamphlet further.

-Weaknesses

A focus group can mask dissenting views (O'Cathain *et al.*, 2015), and as some participants were more vocal than others, the risk that premature closure of concept was present. Two participants left five minutes before the conclusion of the focus group, meaning that their input was not present for all topics covered within the session. Not all of the pamphlet users from the quantitative part were recruited into the focus group, due to dropout. Therefore not all of the pamphlet users' views are represented within this qualitative part, however, all of those completing the study within the intervention group attended the focus group. Using participants based in one centre only is a limitation, as there is a possibility the intervention could be tailored to suit that particular centre alone (O'Cathain *et al.*, 2015). Although not discussed by the participants, the pamphlet could have included clearer signposting towards each weblink, by including a concise description of what each weblink contained.

7.19 Part two conclusion

The pamphlet was utilised by the participants, and was seen as a favourable addition to the classes, with potential for further enhancement. The key components included within the pamphlet, supported by previous BCT research, were

recognised and utilised by the participants. None of the content, or the format of the pamphlet, was perceived negatively and the pamphlet was seen as acceptable in its first iteration. However, the participants provided insightful information explaining why certain aspects of the pamphlet were more positively portrayed, and how the pamphlet could be improved in future iterations. A positive finding was that participants felt they learned and gained from the pamphlet and saw it as a positive, with further scope for development. A key benefit of gaining qualitative data within a pilot study is that it helps refine understanding of how an intervention may work, or facilitate adaptation (O'Cathain *et al.*, 2015), which has been exhibited in this case. An additional benefit, is that in the process of assessing the acceptability of an intervention, participants may also identify issues (O'Cathain *et al.*, 2015). In this study, participants identified issues with the pamphlet weblinks, where some of the exercise plans did not work. This had not been recognised when the weblinks were first included in the pamphlet.

In order to appraise the success of this trial in relation to the aims of this part, it is important to review the criteria set:

> "Aim 3: Examine the acceptability of the educational pamphlet regarding its use, usefulness, content, and format and to provide an opportunity to develop the pamphlet further. The feasibility trial will be considered successful if participants' preferences are favourable towards the use of the educational pamphlet, in its current form, or with modification"

Using this criteria, it is clear that the pamphlet was acceptable. Qualitative research within feasibility studies, has the benefit of addressing if the intervention is acceptable in principle, but also in practice (O'Cathain *et al.*, 2015). This study demonstrated that the intervention was supported by the participants in its current form, in terms of its underpinning principle, and its application in practice, within the context of the Healthy Lives classes.

It therefore appears that the criteria for success within this part have been satisfied. The pamphlet was favourably reviewed in its current form, was utilised by, and helped in part, to educate the participants. The pamphlet has potential to be used more widely in an enhanced form, by incorporating the participants' suggestions for future iterations.

7.20 Chapter 7 Discussion

The aim of this study was to develop an educational resource for the Healthy Lives class participants and assess the impact of the resource on: fitness class

attendance, levels of participant activation, and finally, assess the acceptability of the resource. A mixed methods pilot trial was utilised to address the aims. This provided a comprehensive approach to increase confidence in the findings (O'Cathain, Murphy and Nicholl, 2007), and attempt to understand the complexity of implementing an intervention, by investigating barriers and facilitators relating to the intervention, within a given context (Green *et al.*, 2015).

Part one consisted of a quasi-experimental pilot trial, using two parallel (control & intervention) groups to assess the recruitment, randomisation and retainment of participants, while recording changes to fitness class attendance and PAM scores.

Attendance and PAM scores did not reduce in either group, with the intervention group recording minimal increases in both. The willingness to be randomised and retention of participants as a whole was acceptable, with 68.4% of all participants and 67.9% of outcome measures retained at the conclusion of the study. However, the pilot suffered from insufficient recruitment and attendance data, which limit the ability to interpret the quantitative findings.

The PAM questionnaire was selected as an outcome measure owing to its validity, reliability (Hibbard *et al.*, 2005) and its simplicity to assess patient activation (Hibbard and Gilburt, 2014), which over time, can consistently and accurately capture changes in patient activation (Hibbard and Gilburt, 2014). PAM has been applied within three main areas: 1) intervening to improve patient engagement and outcomes, 2) population segmentation and risk stratification to target interventions and 3) measuring the performance of health care systems and evaluating the effectiveness of interventions to involve patients (Hibbard and Gilburt, 2014). Within this study, PAM was applied to align with the third use. PAM was a secondary outcome measure, used to assess if patient activation changed within either group, or if it changed in the intervention group, which was provided with the educational pamphlet. In a review of four exemplar studies, including COPD or stroke patients within the UK, Roberts *et al.* (2016) supported the use of PAM as an outcome measure. However, Hibbard and Gilburt (2014) suggest that caution should be exercised if PAM is used as a generic outcome measure, as patients with lower levels of activation may need additional support, to improve activation before the intervention starts or during the intervention itself. Roberts *et al.* (2016) supported this, and recommended that patient demographic and patient history information should be utilised together with PAM. Additionally, Roberts *et al.* (2016)

recommended that these details should be regularly recorded to understand the patients PAM score and explain the changes that may occur over time. A criticism of this current study is that the participants were provided with the educational pamphlet regardless of the PAM score, and that the educational pamphlet was not tailored individually to the participants. While the pamphlet itself included components that could support elements of patient activation (i.e. advice relating to teach to use prompts, provide instruction on how to perform the behaviour, and consequences of the behaviour), they were not tailored to the individual, did not take into consideration the patient history, and did not consider what extra support a participant could be provided if they recorded a low PAM score. In retrospect, it would have been more appropriate to consider what extra support participants could be provided with, or signposted to, if they did score low on the PAM score.

With regards to the use of PAM on a wider scale, for example to tailor interventions or to be used as a screening tool within ERS, it is difficult to support its application due to the very limited research undertaken. A recent scoping review by Kearns *et al.* (2020) investigated how PAM was integrated into models of care, as opposed to measuring the impact of an intervention on the PAM score alone. Part of the review investigated how PAM-tailored interventions impacted on clinical indicators and self-management behaviours. The results were equivocal, and Kearns *et al.* (2020) concluded that further research on the value of PAM and its use to tailor interventions is needed, and that generalisations about the findings were difficult to make. Only one of the papers included in the review considered exercise or PA and was in the context of patients with heart failure. Therefore, further research on the use of PAM as an outcome measure, or as a method to tailor interventions for ERS is required, before it could be considered as a tailoring tool, particularly in light of the need for clinician “buy in” as highlighted by Kearns *et al.* (2020). In terms of screening, Roberts *et al.* (2016) suggested that PAM has the potential to do this, and stratify patients, by supporting decisions to delay or advance referrals, or to support patients with additional educational information. However, this was based within pulmonary rehab only, and within a small dataset. Using PAM within an ERS context could potentially be beneficial to screen or stratify patients. For example, patients with low levels of activation could be provided with more support or delayed from starting a referral, until they had increased their levels of activation. While this may be an attractive option, research is required to understand whether baseline PAM scores within an ERS are suitable to screen or stratify care.

While PAM could potentially be utilised within ERS as an outcome measure, it is important to consider that PAM score increases may not alone signify effective interventions, and maintaining PAM scores over a sustained period of time may also be important (Roberts *et al.*, 2016). Roberts *et al.* (2016) and Kearns *et al.* (2020) have both commented on the need for further research on PAM. There is a scarcity of robust research that understands the effectiveness and utility of PAM for long term conditions within a UK context (Roberts *et al.*, 2016). Additionally, research is required to increase understanding on the role and value of PAM to tailor interventions (Kearns *et al.*, 2020). A final consideration relating to PAM, is that while the four different levels of activation provide guidance on a patients level of activation, it is not clear during the development of PAM (Hibbard *et al.*, 2005; Hibbard *et al.*, 2004), how each range of PAM score was assigned to each level, and whether the cut off point for each level is valid. The implication of this is that tailoring on the basis of the PAM level alone, especially in light of the recommendations of Roberts *et al.* (2016) and Kearns *et al.* (2020), may not provide ERS staff with clear way of tailoring, or understanding the level of activation of the patient. Therefore, at present, it would be difficult to recommend widespread use of PAM within ERS as a tailoring tool, or as a screening tool, until further research specific to ERS is undertaken.

A focus group investigated the pamphlet users' views on the acceptability of the pamphlet and how to improve it for future iterations. This revealed that the pamphlet was received in a very positive manner by the participants. The pamphlet was read, utilised and provided novel information about topics the participants wanted to know more about. The pamphlet format and structure was also positively reviewed, and the participants recommended that the pamphlet should be distributed to the classes in the future. Minor suggestions to improve the pamphlet were provided. One of the weblinks contained missing content, highlighting the limitations of using external websites. Additionally, participants felt that the pamphlet could highlight the benefits of attending an inclusive and diverse class more clearly. The qualitative feedback for pamphlet was very encouraging, particularly relating to the components that were discussed in a positive manner, that had been included based upon the findings of chapter five and using the wider literature. This highlights the importance of translating research into practice (Michie, Van Stralen and West, 2011), by developing an intervention based upon a theoretical underpinning and awareness of the context in which the intervention was developed and trialled (O'Cathain *et al.*, 2015).

Both parts of this study were able to provide a comprehensive assessment of the intervention and the implementation of the pilot study itself. This study demonstrated that the educational pamphlet and PAM questionnaire were easy to distribute and measure, and the pamphlet was deemed to be acceptable by the participants. Mixed method approaches can use a pragmatic approach to address questions within the complexity of health (O'Cathain, Murphy and Nicholl, 2007). This was evidenced, by successfully designing, implementing and assessing an intervention using quantitative and qualitative measures. Both highlighted strengths and weaknesses, and more importantly, solutions to overcome any barriers towards developing the pamphlet further, and assessing its impact more robustly. Part one highlighted the importance of providing more than one opportunity for participants to be recruited, and the potential impact of when the recruitment takes place. Class attendance was low when the recruitment took place, during the summer holiday period, limiting the potential number of recruits. Finally, the pilot revealed that recording class attendance with the SCUBA system was problematic. Not all participants owned a SCUBA card, and the system was unreliable at retrieving attendance data.

Strengths

The pilot study utilised a well-defined set of aims and outcomes to assess the success of the study, adding methodological rigour (Lancaster, Dodd and Williamson, 2004). The evidence based intervention was assessed within a contextually appropriate environment, an important aspect of assessing complex interventions with pilot studies (Craig *et al.*, 2008). This pilot used a controlled study to assess willingness to be randomised, and was able to assess the ability to gain consent and recruit, while highlighting barriers to recruitment, which are important aspects of piloting (Lancaster, Dodd and Williamson, 2004). The pilot afforded valuable experience in the recruitment process, providing insight into utilising more appropriate and efficient recruitment (O'Cathain *et al.*, 2015) for any future studies. The outcome measures and acceptability of the intervention were assessed, providing insight into the reliability and feasibility of using the outcome measures and the intervention itself (Lancaster, Dodd and Williamson, 2004).

Utilising a mixed method approach is a particular strength of this study, as this provided a more comprehensive assessment, to support a more nuanced understanding of the intervention and provided a richer understanding of the implementation process (Green *et al.*, 2015). Mixed methods can, and did, highlight the barriers of implementation, but also facilitators of implementation (Green *et al.*,

2015). This approach assessed the acceptability of the intervention in principle, in the form of a pamphlet, as well as the acceptability and feasibility of the intervention in practice (O'Cathain *et al.*, 2015). This approach gained the views of participants, who provided data on the future fidelity and reach of the intervention, a benefit of utilising qualitative research within a feasibility trial (O'Cathain *et al.*, 2015).

Weaknesses

The key weakness within the study was the recruitment method. Using one recruitment day per group significantly curtailed the ability to recruit willing participants. This in conjunction with the timing of the study during the summer period, limited the number of potential participants, and resulted in insufficient recruitment that was unable to absorb dropout. Providing the opportunity for willing participants to return consent forms and PAM questionnaires following the class for example, would have increased the recruitment at baseline. However ethical agreement did not permit this during the recruitment days.

Using only two of the four centres delivering the exercise classes as part of the study limits the methodological robustness of the study. Additionally, the lack of randomised allocation to control or intervention group on an individual participant level (the study randomly selected two centres to be part of the study) limits the quality of the study. While attendance was the primary outcome measure, and a focus of the thesis, it is noteworthy to consider that the participants within this study were older adults already engaged in exercise. Therefore, the participants within this study are from a population that is most likely to attend and do not represent the populations that have previously been identified as most at risk of dropout.

7.21 Chapter 7 Conclusion

This mixed methods pilot study was able to develop, design and trial an intervention targeted towards a specific group, using data gained from a relatable population, and review the findings using quantitative and qualitative methods. Developing and evaluating this intervention, in this manner, for this population is novel. The three aims defined at the start of the study, containing pre-specified outcomes to measure the success of the pilot by, were successfully met. This study successfully developed knowledge regarding the recruitment, retention, outcome measure collection and completion, within the Healthy Lives fitness classes. The study successfully gained insight into the acceptability of the intervention, and provided insightful information about the opportunities to develop the intervention in any

future iterations. The rationale of a pilot study is to investigate areas of uncertainty (Eldridge *et al.*, 2016a), and this pilot successfully indicated that the educational pamphlet as an intervention, was acceptable to the participants and easily distributed within the fitness classes. The study indicated that the PAM questionnaire was a simple and easy outcome measure to utilise. Additionally, the study uncovered two areas of uncertainty, namely recruitment and class attendance measures. Recruitment issues could be addressed by offering more opportunities for participants to be recruited, with the option to fill out documentation without being in close proximity to the start or finish times of exercise classes. Class attendance measures could be addressed with a more robust and reliable electronic swipe-in system, and provision of swipe card for all class attendees. If these areas can be addressed, then the pamphlet has potential to be a viable intervention for further investigation using a larger study, such as an RCT. Until the pamphlet is more robustly assessed, it will not be possible to consider the impact that may, or may not have on class attendance and patient activation.

Chapter Eight: General discussion and conclusion

8.1 Introduction

The research within this thesis was driven by the limited adherence reported within Exercise Referral Schemes (ERS), and the lack of extant investigation understanding or explaining the levels of adherence. Adherence ranges from 43-53% (Murphy *et al.*, 2012; Pavey *et al.*, 2012; Tobi *et al.*, 2012; Hanson *et al.*, 2013), however very limited research on the personal and referral characteristics of participants that dropout of ERS exists, beyond age and gender. Additionally, very limited research has attempted to understand or explain the limited adherence, and when doing so, has not focused on the experiences of dropouts, or the reasons explaining dropout.

A review of the literature indicated that the current approaches to evaluating ERS, predominantly through quantitative research and RCTs alone, were inadequate to address the issues related to limited adherence. This thesis, therefore, deviated from a single research approach, and utilised mixed methods to address the limited knowledge about ERS dropouts and the reasons for dropout. The NICE (2014b) ERS research recommendations supported the aims and design of this thesis. This ensured that the thesis could address key gaps within ERS literature, provided an original contribution to knowledge, and could provide impact by disseminating the findings through publication(s) to support policy decisions and practice, but also through conference presentations to support practitioners and fellow researchers.

In terms of original contribution to knowledge, this thesis has identified new predictors of adherence, such as self-reported barriers that included a lack of motivation or a lack of childcare, and identified predictors of dropout that included smoking and Tier 3 referrals. The thesis investigated the views of ERS dropouts that are from a group that make up the majority of dropouts (dropout within the first six weeks) and have an increased likelihood of dropout (those under 55 years old).
This uncovered reasons why participants dropout, what barriers to adherence they faced, and how they would improve the ERS. These findings were supported by the views of adherent participants from the same ERS, gaining insight into the barriers they also faced and overcame, what they felt participants needed to successfully

adhere, and provided suggestions to improve the ERS. This information was used to design, develop and implement an original educational pamphlet in the remnants of a decommissioned ERS, and assess the acceptability of this pamphlet as an intervention, using a mixed methods pilot study. Finally, by utilising a mixed methods approach, this thesis gained a detailed and rich understanding of the ERS from multiple perspectives and provided detail relating to groups that are poorly served by ERS, and how barriers to adherence are individually experienced. In doing so, this thesis has provided an original contribution to knowledge, in an area that has limited research (Oliver *et al.*, 2016) and has potential to inform more effective practice.

8.2 Overview

The NICE (2014b) ERS research recommendations supported the development of the thesis aims. Four components significantly influenced the aims. These components consisted of two research recommendations and two areas which have knowledge gaps, namely:

Research recommendations:

1) What factors encourage uptake and adherence?
2) Identify any barriers preventing participation

Areas with knowledge gaps:

1) Information on factors that encourage participation during and after an ERS
2) Prevent or reduce the risk of dropout by those referred to ERS

The components were used to develop the following thesis aims:

- To investigate the adherence rate of a current ERS
- To investigate what, if any, personal or referral characteristics are more likely to be associated with dropout or adherence.
- To investigate what, if any, personal or referral characteristics, including barriers to exercise predict dropout or adherence.
- Increase understanding of what the barriers and facilitators to ERS adherence are.
- To explore why the barriers and facilitators are present.
- To explore how to overcome/facilitate overcoming the barriers, and enhance the facilitators.
- To design and implement an intervention, in the form of a pilot study to increase adherence.

An overview of each chapter will be discussed, highlighting how each intended to address the aims of the thesis. Following this, section 8.2.1 critically synthesises how the thesis taken as a whole, adds original knowledge to the understanding of ERS and how the findings address the aims of the thesis.

Chapter four (study one) focused upon addressing the first four aims, working in partnership with South Tyneside Council's ERS to analyse a large set of secondary data, which had been collected over the course of five years. Establishing the adherence rates of the ERS provided a baseline for the thesis using an explanatory design, and made it possible to compare the ERS with published data. Investigating the data for associations or predictors of adherence across personal or referral characteristics provided contextual understanding of the ERS and its participants' particularly in relation to predictors of adherence. Some data were also able to elucidate what the barriers to ERS were, through analysis of the self-reported barriers to exercise that were provided by the participants when they had started the ERS.

Chapter four integrated with chapter five (study two), as the factors that predicted dropout were used to inform the recruitment criteria for study two. This chapter aimed to address the fourth, fifth and six aims, by investigating the views of both adherent and non-adherent participants to the ERS. Eleven participants, all aged under 55 years old, who had dropped out of the ERS within the first 6 weeks were interviewed. Following this, a focus group consisting of nine males, all aged over 55, who adhered to the ERS was completed. Gaining the views of adherent and non-adherent participants provided a more complete understanding of the experiences that participants had of the scheme. The interviews investigated the reasons for dropping out, and the barriers and facilitators to adherence. The focus group investigated the barriers and facilitators to exercise, and the keys to successful adherence. The interviews and the focus group also investigated how the participants would improve the ERS in the future, with both adherent and non-adherent participants providing clear suggestions to improve the ERS, and guidance on overcoming barriers to adherence. Ideally, the recommendations from the participants and lessons learned from the chapter could have been implemented into the South Tyneside ERS, however, the decommissioning of the ERS made this impossible.

Chapter Seven (study three) piloted an evidence based educational pamphlet, in order to address the final aim of the thesis. The pamphlet contained information

informed by the chapter five findings. The format and how this information was delivered within the pamphlet was underpinned using evidence, and framed using Behaviour Change Techniques (BCTs) that were chosen based upon the evidence base. Due to the decommissioning of the ERS, an alternative scheme was required to pilot the pamphlet with. The remnants of the South Tyneside ERS existed in the form of the "Healthy Lives'" fitness classes. Many of the participants that would have previously been referred to the ERS, attended the classes as an alternative. The Healthy Lives' classes were viewed by the council as the ERS replacement; therefore, it was logical to pilot the pamphlet there. Similar contextual factors between the ERS and the fitness classes remained, including the locations, the staff, and the participant demographics. However, some differences were present, such as no referral requirement, no assessment or 12-week timeline. The drawback of this was developing and applying an intervention using data from a different service. However, in what appeared to be a culture of decommissioning, it was clear that developing an intervention for another ERS was not only contextually undesirable, but also risked developing something which had no future to provide any impact. Therefore, piloting the pamphlet in the Healthy Lives classes was justifiable, albeit not optimal. A quasi-experimental pilot trial, containing two parallel groups, one provided with and one without the pamphlet, was utilised to assess the recruitment, randomisation and retention of participants. Class attendance and the Patient Activation Measure (PAM) was recorded to investigate the impact of the pamphlet. A focus group followed the trial, to gain the participants' views of the pamphlet and the acceptability of it.

8.2.1 Synthesis of findings

As a whole, the thesis was able to gain novel insight into the barriers and facilitators of ERS adherence. A theme running through each of the three studies, was the impact of age. Non-adherent participants were younger, and younger age predicted dropout. Younger participants appeared to have less time due to work, family or education commitments, and could not prioritise exercise as well, or as easily as older individuals. They also perceived the ERS to be more suited for those that did not work. The adherent participants who were older, supported the notion that increasing age and therefore being retired, afforded more time to exercise. Interestingly, the participants recruited in the third study from the Healthy Lives classes, which were scheduled during working hours, were on average 69.6 years old.

While the relationship between older age and ERS adherence has previously been reported, investigating the views of younger non-adherent participants is novel. This provides original insight into the barriers that they face when attempting to engage with an ERS. Non-adherent participants were able to provide suggestions to improve the ERS for participants that worked, and required an increased number of timeslots to attend assessments, or the gym itself. Therefore, increasing the number of evening slots for assessments (for example) could provide more flexibility for younger participants. However, it is not clear if this would automatically result in increased adherence and could be investigated further. The insight gained relating to age, and the barriers that younger participants may face, with the suggestions they provided to improve the ERS, were all novel and supported satisfying the second to sixth thesis aims.

Understanding more about exercise, and in particular nutrition, appeared to be important for participants within all qualitative components of the thesis. Across all studies, more information and education relating to nutrition was requested, and when provided within the pamphlet for study three, it was appreciated by the participants. Although positively commented upon in study three, participants still felt there was scope for more information about nutrition that could be provided. Participants described a lack of knowledge, or a lack of confidence in their knowledge about nutrition and recognised this was an area that required further support. These findings highlight an area that has not previously been investigated within ERS and provides guidance about the type of information ERS participants value. Interestingly, the nutrition referrals in study one, recorded the highest percentage of dropout amongst referral reasons. While the qualitative findings are not able to explain why this was the case, it may however, suggest that nutrition is an area that requires further investigation or support within ERS.

Education relating to exercise was also discussed in various guises across all qualitative components of the thesis. Non-adherent participants requested more information and education about exercise, in order to rely less on others, or to rely less on the gym as a place to exercise. Adherent participants and those using the pamphlet in the Healthy Lives classes did request more information about exercise. However, they suggested more of an emphasis on promoting the benefits of exercise, to help encourage others attend, especially as they themselves personally, had recognised the benefits of exercising. Recognising the benefits of exercise appears to be a facilitator to adherence in this thesis, and has been supported within

the literature (Pentecost and Taket, 2011; Morgan *et al.*, 2016). However, until now, the views of non-adherent participants about exercise have not been reported or investigated and supports the sixth aim of the thesis.

Communication was often discussed in relation to dropout and has some links to education. Communication (or a lack of) between participants and staff was an important topic for participants that dropped out. Participants described issues about the instructions they were provided to use the gym equipment, finding it difficult to remember or take in. This could in part, explain why participants requested more information relating to exercise. Providing clearer instructions about equipment, and education about exercise, could support a more autonomous approach for participants to manage their own health, and therefore rely less on ERS staff.

Study two highlighted how communication could be inadequate in the first assessment, with limited collaboration in terms of goal setting or exercise planning, which could result in negative consequences such as an exacerbation of pain. A limited ability to consistently or reliably contact staff, added to the communication difficulties. This was compounded by the perception that assessments were at times, viewed as a tick box exercise, with limited scope for an individualised programme. All of the communication issues described would have manifested during, or shortly after the first assessment, and the majority of dropout, as established in the first study, occurred in the first six weeks of the ERS. Therefore, it may be that these communication issues contributed to dropout occurring earlier, rather than later in the ERS. Although investigation into why dropout occurred predominantly in the first six weeks wasn't directly addressed, these findings do provide a rationale about why dropout may have occurred within the first six weeks. The novel insight gained relating to communication, was able to partly address the fourth to sixth aims of the thesis.

Exercising in the presence of other individuals was discussed as a barrier, or a barrier to overcome, in all qualitative parts of the thesis. Often, participants did not feel comfortable exercising in the presence of others, due to feeling out of place or being body conscious. Non-adherent participants described feeling uncomfortable exercising in front of others in the gym as a barrier to adherence. While those who adhered, described having to overcome feeling uncomfortable or embarrassed when exercising in the presence of others. Within the third study, the main suggestion made by the participants to improve the educational pamphlet, was to provide a picture of the class onto the front cover. This was to help promote the

inclusivity of the class and reduce the perception that it was only for muscular individuals. Qualitative ERS research has previously reported participants citing the gym, or feeling embarrassed as a barrier to adherence (Morgan *et al.*, 2016). However, this thesis is one of the few, including Martin and Woolf-May (1999), to have specifically recruited dropouts to understand their reasons for dropping out, and the first to recruit participants that are from a group (younger, dropping out within the first 6 weeks) that are more likely to dropout and provides novel insight. It is however, noteworthy to highlight, that feeling embarrassed or uncomfortable when exercising in the presence of others, does not appear to be isolated to younger participants, as this was described or discussed in all qualitative studies within the thesis. Taken as a whole, from adherent, non-adherent and Healthy Lives class participants, the thesis was able to gain a novel range of views relating to how participants feel, and what barriers they need to overcome, supporting the fourth and fifth thesis aims.

Participants referred with a mental health condition had a significantly higher dropout compared to other referrals within the first study. While this has been reported previously (Dugdill, Graham and McNair, 2005; Moore *et al.*, 2013; Tobi, Kemp and Schmidt, 2017), it is not clear why this is the case. Study two provided some limited insight into the experience of an ERS participant with a mental health condition who had dropped out. The participant described a need for more specificity/tailoring of the ERS towards her mental health condition, and that a peer support system for participants with a mental health condition, would be viewed as beneficial. It could be the case that the support provided for ERS participants with mental health conditions as a whole, is lacking, and therefore negatively influences adherence. While only one participant with a mental health condition was interviewed, and provided limited detail about her mental health, this provides some novel insight into the differing requirements or requests of participants with different health conditions, and helps address aims four and six.

This thesis has added original knowledge towards the understanding of the barriers and facilitators for ERS adherence. While section 8.5 describes the contribution to knowledge each individual study within the thesis has made, this section considers the original contribution made by the thesis as a whole. The thesis as a whole, contains qualitative and quantitative data, recorded over the course of nine years (2009-2018). This provides novel insight not only into the ERS, but its replacement following decommissioning, the Healthy Lives classes. The thesis has highlighted

the specific barriers and facilitators that ERS participants encounter, and has investigated the views of participants that are from groups that are either more likely to adhere, or more likely to dropout. Doing so, has helped understand what participants need to overcome, or what they feel is required to improve the ERS. As discussed earlier, the thesis has gained novel insight into the different experiences' participants have of the ERS, across different ages ranges, which are associated with different levels of adherence. This highlighted some commonalities within the barriers that younger participants faced, and the facilitators older participants encountered.

The thesis also highlighted that the experience each participant had, was influenced by factors that were individual to the participant. This included examples such as their expectations, aims, experiences with staff, motivation and whether they were able to recognise the benefits of exercising. Participants within study two, expected some elements of consistency and procedure, such as when and how they could contact staff, however, they also expected a level of individualisation. To a lesser extent, participants in study three shared some similarities. While they attended the Healthy Lives classes which were very structured and consistent in terms of what was delivered and when, the participants appreciated the advice and education to support exercise beyond the classes, through support of the pamphlet. This highlights the difficulty ERS face, when trying to strike a balance between consistency, with scope for tailoring and individualisation. Taken as a whole, the thesis demonstrated that a balance between structure and individualisation appears to be important. Too much structure or a lack of flexibility may be a barrier for younger participants, especially if it comes at the cost of individualisation. However, too much flexibility or individualisation may not possible or desirable, for all participants. However, striking this balance and establishing what it is, is difficult due to the heterogeneity of participants within ERS. The implications this has on practice is discussed in section 8.3

8.3 Implications

8.3.1 Implications for practice

This thesis has demonstrated that ERS participants believe that "one size does not fit all" and that ERS should not be seen as a simple or arbitrary process of referring individuals to the gym, hoping for a favourable outcome. The importance of communication was highlighted, as poor or limited communication was barrier, or a precipitating factor in dropping out. Improving communication in terms of

opportunities to contact staff with queries or concerns, would be a method of overcoming some of the existing communication barriers. A clear and consistent method of communication would need to be established, to avoid unnecessary variability between different staff. However, a small range of options for participants to communicate through, would provide some tailoring towards participant preferences. For example, participants could agree with the member of staff they are assigned to, a way in which queries or questions could be communicated, from a small range of options, such as email, text or phonecall. Providing clarity about how quickly emails or texts could be responded to by staff, or when calls would most likely be answered/replied to, would be required. This would provide a response time for participants to expect, and staff to aim for, resulting in all participant queries being managed in a timely manner. This could also serve to increase the confidence that participants would have in being able to contact staff, therefore reducing a communication barrier. However, this would potentially create more workload for staff, requiring them to check across various communication options each day (such as emails, texts and phone), and would require time in each day dedicated to responding to questions to queries. Despite the barriers of implementation, a clearly signposted line of communication, with consistent monitoring by staff, could serve to improve communication between participants and staff.

Communication during the initial assessment could be improved, to ensure that participant aims, goals or preferred methods of increasing PA are used to develop a tailored plan for the individual. The initial assessment could also serve to screen for any concerns, anxieties or problems that the participants may envisage with the referral, which could relate to time management, concerns regarding existing conditions, or feeling uncomfortable with the concept of exercising in the gym environment. Many of these issues were reasons for dropping out, or at least a barrier to adherence, and could potentially be overcome through effective communication to address the issues. Providing time during the initial assessment, dedicated towards focusing on the participants preferences, and screening for concerns, anxieties or barriers would be required. This may require additional time within an assessment or removing aspects from the assessment, that may not be required, or as important. During the assessment, care would be required to emphasise the importance of, and act upon, the participants preferences or concerns. This would avoid the assessment being perceived as a tick box exercise, which was reported as an issue by participants within the second study. Introducing this additional aspect of assessment may be resisted by staff, not only due to the

increased workload, but may suffer from limited “buy in”, in a similar guise as reported by Moore, Moore and Murphy (2012), in relation to the introduction of motivational interviewing.

Various participants perceived the ERS to focus on, or be geared towards, unemployed individuals. Therefore, providing more opportunities to attend assessments and sessions within work-friendly hours could reduce these barriers. Providing an element of variety to the modes of exercise could also serve to overcome barriers regarding boredom with the gym, and reduce anxiety related to gym attendance.

A strength of this thesis is that the methodology allowed participants to communicate their views, and to provide input towards supporting the Healthy Lives classes. To aid communication, participants requested more information to support their time in the scheme, but also to rely less on the scheme as venue to exercise. Providing more information was important for this, but also because participants were not sure how to exercise beyond the gym, or how to identify opportunities to exercise. These were barriers to increasing activity levels, therefore, communicating information regarding exercise could be a beneficial addition for ERS.

The suggestions and requests from participants were used to develop, and then pilot, the educational pamphlet within the Healthy Lives classes. Pamphlet users reported learning new information about nutrition, using weblinks to exercise beyond the classes, and they recommended that the pamphlet should be provided to class attendees in the future. Providing an educational pamphlet to attendees of the Healthy Lives exercise classes was a successful endeavour, which could be continued in the future to support the class.

While a request for nutritional information was often made by adherent and non-adherent participants alike, it was not related to being a barrier to adherence. However, it could be provided to participants within ERS to support a more holistic approach to a healthier lifestyle, and support the process of increasing activity levels, or weight management, which are common referral reasons into the ERS.

The first 6 weeks of the scheme are important, as the majority of dropout occurs during this time, with participants under the age of 55 accounting for the most of dropouts, and smokers being more likely than non-smokers to dropout. This information could conceivably be used to inform a decision to make a referral into

the ERS or not, by considering the likelihood of the referral being successful. Males over the age of 55 who do not smoke, possess characteristics that are associated with successful referrals and adherence, therefore, could be referred with more confidence.

By investigating the views of ERS participants, this thesis has gained valuable insights into potential methods of improving the experience for individuals attending an ERS. The pamphlet feedback and the suggestions to improve the scheme, especially communication, have implications for practice. However, these findings have not been assessed to address their impact on attendance, particularly in the longer term, thus warranting further investigation into this metric.

8.3.2 Implications for future research

This thesis has provided a foundation for future research that was not previously present. The acceptability of the educational pamphlet was established, and the thesis highlighted that ERS participants want more information in order to develop a more autonomous approach to PA. This thesis has also provided insight into why participants dropout of schemes and what barriers they experience. The findings have provided original knowledge, therefore open a range of avenues for future research opportunities.

A limitation of this thesis (described below, in more detail in section 8.4), is that it was not possible to develop an intervention for the ERS. Additionally, the intervention that was developed for the Healthy Lives class, did not adequately assess, or impact on adherence. However, the information learned from the thesis, could guide further research to overcome some of these limitations.

Assessing the impact of a modified initial assessment on ERS adherence, which increases the focus on participants concerns, barriers and goals, could be pragmatically trialled. This could be conducted by modifying the assessment for participants that do not appear to be well served by the ERS. For example, younger participants or those with mental health conditions, could benefit from a modified assessment to investigate the barriers or concerns they have, and this could inform how the programme they are provided with, is planned and delivered. The benefit of approach is that the structure of an ERS would not be dramatically altered, as changes would only be administered during the initial assessment. This would therefore make it simpler to compare the impact of the modified assessment, with

other participants that have not used a modified assessment within the same scheme.

Using attendance to an assessment as a proxy measurement of adherence has been criticised (Campbell *et al.*, 2015; Shore *et al.*, 2019) and remains an issue. The use of SCUBA in this thesis to measure attendance, was not on the whole successful. However, if the accuracy of the system could be improved, and all participants are provided with a card as part of a swipe-in system, then a more appropriate measurement of adherence through attendance could be gained. From a methodological standpoint, this would make measurement more accurate, and in the future, having attendance data could support staff during the midpoint assessment, to discuss how to improve attendance or maintain it.

However, these recommendations are limited by the decommissioning of ERS and the future use of them in the UK to support PA. If the future does not lie with ERS, then this thesis has provided a foundation for further research in one of the alternative options to ERS. Building upon the acceptability of the pamphlet and establishing whether the educational pamphlet can have any impact in measures beyond qualitative feedback would be beneficial. The thesis demonstrated the ease with which the pamphlets can be distributed, the ease of using the PAM questionnaire, that participants did not have an issue with being allocated to a control group, and that there was a willingness to be recruited. The pilot study provided insight into the limitations of the recruitment strategy employed. A future study would require more opportunities to recruit, over a longer period, and allow participants more opportunities to complete questionnaires before starting the study. These measures alone, would likely make recruitment more successful, for a more robust study.

The educational pamphlet could also be assessed within an ERS context, as much of the information included would be appropriate for an ERS. Implementing the pamphlet as part of an intervention to increase adherence (notwithstanding the issues related to SCUBA or measuring adherence), could be facilitated and could support the initial assessment with participants. Assessing the pamphlet within an ERS, where adherence is limited, would provide greater insight into the feasibility of using a pamphlet, compared to assessing it within the Healthy Lives exercise classes.

If the pamphlet could not be trialled within an ERS, a more robust assessment of the pamphlet within the Healthy Lives classes is warranted. While it may be

premature to suggest a full RCT for this work, a larger pilot study to consider if the pamphlet is acceptable for further investigation would be appropriate. A more robust recruitment method, with a more comprehensive measurement and understanding of healthy lives class attendance, would provide further insight into the impact the pamphlet may have on adherence.

8.4 Strengths and Limitations

The overriding methodology employed in the thesis is a key strength. Mixed methods provides the opportunity for greater understanding of a research question, in comparison to a single methodology (Wisdom *et al.*, 2012; Palinkas *et al.*, 2015). Mixed methods takes advantage of qualitative methods, focusing on context and the experiences of people, therefore providing the possibility to understand processes and settings (Creswell *et al.*, 2011). Mixed methods can also support research questions requiring real-life contextual understanding and multiple perspectives (Creswell *et al.*, 2011). The use of quantitative and qualitative methods provided greater insight into which groups of participants dropped out, including the personal or referral characteristics, and provided insight into why these participants dropped out, or barriers that they faced. The data for all studies within the thesis, were generated from real life contexts, within the South Tyneside ERS and the Healthy Lives classes. Gaining the views of participants that had dropped out of the ERS and those who had adhered, provided multiple perspectives of the ERS. Gaining the views from participants that were either less likely to adhere (younger participants) or those who are more likely to adhere (older males), also provided the opportunity to investigate and compare the different experiences of these groups. This added new information to the extant research literature for both groups, in particular those who dropout of schemes. How the methods were integrated is a second methodological strength. Using an explanatory sequential building approach provided a logical method for the thesis. The findings from the quantitative study in chapter four, informed the sampling for the qualitative study in chapter five, which was used in part, to understand the findings in chapter four. In turn, the findings from the qualitative study, informed the development of the educational pamphlet used in chapter seven. The integration of the methods helped ensure that the thesis was not composed of three discrete studies.

Individually, each of the studies in the thesis had strengths. Study one, was able to analyse a large data set, and provide a comparison between the South Tyneside

ERS and the extant research, through analysis of commonly recorded personal or referral characteristics, while introducing novel analyses of measures such as self-reported barriers, smoking and alcohol intake. The second study, was able to investigate the experiences of participants that dropped out of the ERS, an area that has been lacking within ERS research (Leijon *et al.*, 2011), and was able to gain a range of views, from a group that was difficult to recruit. The focus group gained insight into a group that is associated with being adherent and is a demographic that has had limited focus in the current literature, as males have typically been included in less qualitative ERS research compared to females (Morgan *et al.*, 2016). Both aspects of the study provided insight to support the improvement of ERS, notably around improving communication, what participants preferred and, in some instances, how this could be implemented.

The final study was able to develop and trial an education pamphlet, incorporating some of the recommendations and findings from the second study. Assessing the pamphlet using both quantitative and qualitative measures was a strength, aiming to gain multiple perspectives relating to the pamphlet, and gained insight into how the participants viewed the introduction of the pamphlet. However, as discussed below, was severely hampered by limited recruitment for the quantitative analysis.

In terms of limitations, chapter four relied on the use of secondary data which were not originally recorded for research purposes. Therefore, a range of outcome measures used by the scheme were inconsistently recorded, resulting in a large number of incomplete participant datasets. This resulted in fewer participants included within analyses. Some data relied on self-reported outcomes, therefore, caution should be taken during interpretation of the findings. A key finding in chapter four related to self-reported barriers to exercise. It was, however, not clear if the barriers manifested themselves during the course of the ERS, or were only present at the initial assessment, making it unclear if the barriers impacted on adherence or not. Although some limitations existed with the data, the dataset available for analysis was very large and, to date, is the largest published within ERS research (n = 6796). The analysis from chapter four identified that smokers and Tier 3 referrals were more likely to dropout. Unfortunately, due to difficulty recruiting dropouts using the two criteria, it was not possible to add further recruitment criteria to investigate the views of smokers or Tier 3 referrals.

The focus group was limited as it gained the views of older males only, providing a narrow view of participants that had successfully completed the ERS. Unfortunately,

it was not possible to interview participants that had cited barriers to adherence that included a lack of childcare or motivation, who had successfully completed the ERS. If this had been possible, it would have helped investigate why these two barriers were counterintuitively a predictor of adherence, as identified in chapter four.

The interviews and focus group were conducted by MK, who had limited experience in either as a researcher, and this may have impacted on how they were managed and analysed. While framework analysis is useful for answering questions regarding specific groups or respondents (Green *et al.*, 2015) and has been utilised in ERS research (Eynon, O'Donnell and Williams, 2018), it has been criticised for requiring a high training component to learn how to code and think reflexively (Gale *et al.*, 2013).

Framework analysis should be led and facilitated by an experienced researcher (Gale *et al.*, 2013). However, this chapter constituted the first experience of framework analysis by MK, therefore is a limitation according to Gale *et al.* (2013), as experienced researchers are more skilled at sifting data, using rigorous and reflective analysis. However, in part to mitigate the limited experience of MK, and increase the trustworthiness of the analysis, double coding of the first four interviews, and of the focus group was conducted by both MK and JN. Additionally, frequent qualitative workshops with MK and JN were utilised to discuss and develop the analysis, while feedback towards the theme development and final themes was provided by another supervisor (SP). This support, plus the transparent approach adopted during the analysis, aimed to ensure the most robust analysis possible. However, a limitation remains that the analysis was subjected to a limited number of different perspectives and not managed by an experienced qualitative researcher as suggested by Gale *et al.* (2013).

Chapter seven was significantly limited by recruitment numbers during the quantitative phase. While the implementation of the educational pamphlet was successful, recruitment made it impossible to adequately assess if the pamphlet has the potential to impact on exercise class attendance or PAM. Relating to the thesis aims, this chapters' key limitation is that the pamphlet was not embedded within an ERS, therefore reducing the relatable context between where the pamphlet was embedded, and where it was developed from. Additionally, the pamphlet was not able to address the issues relating to ERS adherence because of the decommissioning, however the Healthy Lives classes, did have similarities with the ERS in terms of population, location and the staff delivering the classes.

Whilst attempts to measure the exercise class attendance were made, it must be noted that the recruited participants consisted of individuals that had made an active choice to attend, and had not been referred, as per the ERS. Attendance for these individuals, therefore, may not have been an issue. Additionally, most participants were at, or above, retirement age, and in the context of ERS adherence literature, means they are less likely to dropout. In essence, the pamphlet was provided to those who are, if we considered their demographics in terms of ERS data generated in this thesis, and the wider evidence base, more likely to attend. However, the pamphlet did address some of the requests made by older individuals from the focus group in chapter five, who had continued to exercise on their own terms, which mirrors many of the participants within chapter seven, who received and appreciated the pamphlet. While the feedback for the pamphlet was very positive, the participants were aware that the pamphlet had been developed as part of a PhD by the researcher. This could have influenced the feedback of the participants as they could have been more sympathetic and provided feedback that was more positive than they honestly felt.

A final limitation of the thesis is that the generalisability of the findings may be limited. Context is an important consideration and a key reason for utilising a mixed method approach within this thesis. Therefore, the findings are related to the context of the South Tyneside ERS within chapter four and five, and with the Healthy Lives fitness classes for chapter seven.

8.5 Overall original contribution to knowledge and impact

The mixed method approach, integrating the chapter four and five findings, and the mixed methods evaluation of the educational pamphlet in chapter seven, have made original contributions to knowledge.

Chapter four has highlighted specific personal and referral characteristics that are not only associated with, but also predict dropout. This work was published (Appendix 12) in the Journal of Public Health (Kelly *et al.*, 2016a) and is now included within the NICE (2018) Surveillance of PA: ERS (PH54) guideline. The work has been recognised as a response to the NICE (2014b) research recommendations (5.2, “what factors encourage uptake of, and adherence to, an exercise referral scheme?”), therefore directly impacting on the topic area. Prior to this work, the main understanding was that older participants and males were more likely to adhere. However, this work analysed a wider range of variables, within a

greater number of participants than previously published. This demonstrated that Tier 3 referrals and smokers were more likely to dropout, and that alcohol drinkers, older participants, secondary care referrals and participants citing a lack of motivation or a lack of childcare as barriers to PA, were more likely to adhere.

Chapter five investigated the views of participants that dropped out of an ERS, specifically to understand why they had done so, and what barriers to adherence they had faced. No other studies have focused upon this, and none have investigated the views of participants that are at most risk of, and contribute to the majority of all dropouts. Investigating the views of adherent participants has previously been conducted, however, has focused on psychosocial and psychological concepts. This thesis, however, investigated the barriers and facilitators within a low risk group and provided a contrast between adherent and non-adherent participants within the same ERS. Chapter five provides new insight into why participants dropout, the importance of communication, the request for education to support exercise and nutrition, and highlighted what adherent participants view to be important keys to success.

Limited time was discussed as a key barrier, compounded by being younger with work and childcare commitments, while the ERS had insufficient work friendly times to fit with participants' preferences. The gym setting was viewed as a barrier, it could make participants feel uncomfortable, bored, or could exacerbate their pain. Motivation was cited as a barrier and compounded when the participants were not interested in the gym as a method of exercising, or when they exercised around work commitments. Communication issues appeared to be a significant issue for many participants, and a precipitating factor to dropout,

Communication issues manifested themselves in various guises, which could lead to an exacerbation in their pain, due to inappropriate goals being imposed on participants, or difficulty making contact between/with ERS staff. While some of these barriers have been highlighted by Morgan *et al.* (2016), the detail and impact that they had on adherence in this thesis is novel, as the findings explain the specific reasons why participants dropped out.

A range of suggestions were made to improve the scheme by the group of non-adherent participants. These findings are also novel, and provide a direction in which to improve the ERS, aiming to increase adherence. Suggestions to increase work friendly times, the number of exercise classes, and to have more continuity with ERS staff provided logical solutions to some of the reasons for dropout and barriers to adherence, which have not been reported previously.

The chapter five findings included views of adherent and non-adherent participants. Both groups provided clear suggestions to improve the ERS and requested more information about exercise and desired less reliance on the gym as a method of exercising. Providing information in a tangible form, which could be taken away and consolidated, was popular with the participants, as it could support exercise without reliance on the gym. The participants recognised that increasing knowledge about exercise could support a more autonomous approach to exercising and viewed this as an important point. Beyond the request for more information, participants from the focus group did not feel any other changes to the scheme were required. However, they did highlight that being able to set realistic goals, measure progress, and understand why or how exercise is beneficial, were keys to successful adherence, while effort on the behalf of the individual was a requirement.

This chapter was able to address some of the key research recommendations and gaps as highlighted by NICE (2014b), relating to barriers preventing participation, and factors that encourage participation during and after the ERS. These findings provided a novel insight to provide guidance on overcoming barriers to adherence. Ideally, the recommendations from the participants and lessons learned from the chapter could have been implemented into the South Tyneside ERS, however, the decommissioning of the ERS made this impossible.

Finally, chapter seven developed an educational pamphlet, underpinned by the findings from chapter five. The pamphlet was assessed using a pilot trial and a focus group to assess its acceptability. Although the pamphlet was not assessed within an ERS setting and was implemented into a Healthy Lives fitness class, the findings revealed that participants used the pamphlet, felt its inclusion was beneficial, and that it should be provided to future participants within the exercise classes. The content was favourably commented on, due to the readability, ease of understanding, and participants reported learning new information from it. The pamphlet itself appeared to be successful in providing the information that participants had requested in the previous chapters, and these (particularly exercise and nutrition information) were recognised as areas that the participants appreciated. The findings supported the conclusions of chapter five, in that participants are keen to be provided with more information to support their PA and ability to lead a healthier lifestyle

The development and piloting of an educational pamphlet in this manner is entirely novel. To date, there are minimal studies in this context that explore the acceptability

of an intervention. This study provides insight into the parts of the pamphlet that participants used, what they felt was helpful and how to develop it further for future iterations and studies. The pilot study provided valuable information not only on the acceptability of the pamphlet, but insight into how a more robust assessment of the pamphlets impact on class attendance and PAM could be conducted.

8.5.2 Thesis dissemination

The findings from this thesis have been presented in various conferences. I was invited to present a part of "Exercise Referral Schemes: Emerging Evidence and Future Developments" at Durham University, in the Wolfson Research Institute for Health and Wellbeing. This conference provided the opportunity to meet other PhD students investigating other schemes across the UK, and resulted in a conference report being published, which I was a co-author (Rigby *et al.*, 2017). As discussed, the findings from chapter 4 were published, but also included in the Physiotherapy Research Society (PRS) conference poster presentation, which won the best poster award in April 2018 as judged by the three keynote professors. The findings of chapters 4 and 5 were also presented at the Chartered Society of Physiotherapy (CSP) North East regional network conference "Bringing evidence into clinical practice" conference, in November 2018. Finally, the findings were presented in Edinburgh, in November 2019 at the "Cardiovascular Health Event: A focus on physical activity interventions".

8.6 Summary and conclusion

Exercise referral schemes have potential to support a healthier lifestyle by increasing PA levels within a population at risk of, or who have already developed, health conditions associated with a sedentary lifestyle. However, any potential benefits are unlikely to be realised if adherence is limited, which in turn may place schemes at risk of decommissioning. This thesis therefore aimed to understand why adherence is limited, and to support adherence by:

- Investigating the adherence rate of a current ERS.
- Investigating what, if any, personal or referral characteristics are more likely to be associated with dropout or adherence.
- Investigating what, if any, personal or referral characteristics, including barriers to exercise, predict dropout or adherence.

- Increase understanding of what the barriers and facilitators to ERS adherence are.
- To explore why the barriers and facilitators are present.
- To explore how to overcome/facilitate overcoming the barriers, and enhance the facilitators.
- To design and implement an intervention, in the form of a pilot study to increase adherence.

This thesis was able to successfully meet these aims, with the exception of increasing adherence. Smokers, Tier 3 referrals, participants under 55 years old, and those dropping out within six weeks of starting the ERS, represent the majority of, and those at most risk of, dropout. A lack of time, pain, not feeling listened to, feeling the ERS was not appropriate, expense, medication issues and the gym environment are reasons for dropout. Limited time, motivation, and the gym setting were barriers to adherence. While the ERS is a complex intervention, with limited certainty surrounding it, it is clear that participants from high or low risk groups of dropout respectively, appreciate and require effective communication. Additionally, both groups desire more information in terms of nutrition and exercise, to support a healthier lifestyle, whether that is within, or outwith, the ERS environment. Participants within the replacement to the ERS, also appear to desire this same information, to support a healthier lifestyle. Finally, effective goal setting, progress measurement and effort, appear to be important facets in adherence and continuation of PA in the absence of an ERS. These findings have the potential to support existing ERS, by providing guidance on how to improve schemes for future participants. The findings also indicate there is potential to support the Healthy Lives fitness classes within South Tyneside, through the provision of an educational pamphlet. However, how this support will manifest in quantitative measures is still to be determined.

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Glossary of terms

7D-PAR	7-day physical activity recall
BCT	Behaviour change technique
BHF	British Heart Foundation
BMI	Body mass index
bpm	Beats per minute
CABG	Coronary artery bypass graft
CHD	Coronary heart disease
CONSORT	Consolidated standards of reporting trials
COPD	Chronic obstructive pulmonary disease
CVD	Cardiovascular disease
EoP	Exercise on prescription
ERS	Exercise referral scheme
ERQoL	Exercise related quality of life scale
ESES	Exercise self efficacy scale
FEV1	Forced expiratory volume
GLTEQ	Godin leisure time exercise questionnaire
GP	General practitioner
HbA1C	Haemoglobin A1c
IMD	Index of multiple deprivation
IPAQ	International physical activity questionnaire
METS	Metabolic equivalents
MI	Motivational interviewing
MRC	Medical Research Council
MSK	Musculoskeletal
NIH	National Institutes for Health
NHS	National Health Service
NICE	National institute for Clinical Excellence
NCD	Non-communicable diseases
NRD	National referral database
PAM	Patient activation measure
PARS	Physical activity referral service
PCI	Percutaneous coronary intervention
PA	Physical activity
PCT	Primary Care Trust
PHE	Public Health England
RCT	Randomised controlled trial
SDT	Self determination theory
TTM	Transtheoretical model
WHO	World Health Organisation
WHO-5	World Health Organisation Well-Being Index

Appendix 1. Ethics confirmation email

Wed 18/2/2015 15:57
Dear Michael,

This is to confirm that the project listed below has been granted ethical approval. Being a green project working with secondary data, no ethical review is required. Please keep this message for your records.

Good luck with the study.

HLSMK170215
Retrospective analysis of exercise referral scheme (ERS) uptake and adherence.

Mick Wilkinson, PhD
Senior Lecturer
Sport, Exercise and Rehabilitation
Northumbria University
Newcastle-upon-Tyne
England
NE1 8ST
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Appendix 2: Categorisation of referral reason by condition.

Explanation

Condition recorded by scheme	Referral reason category
ACS/CABG/PCI/Valve replacement	Cardio-metabolic
Angina	Cardio-metabolic
Ankylosing Spondylitis	Musculoskeletal
Ante Natal	Musculoskeletal
Anxiety, Stress or Depression	Mental health
Arthritis/Joint pain	Musculoskeletal
Asthma	Cardio-metabolic
Back pain	MSK
Back pain (neurological)	MSK
Brachial Plexus	MSK
Breathing problem (inc. COPD/Bronchitis)	Cardio-metabolic
Cancer	Other
CHD including MI/Heart failure	Cardio-metabolic
CHD Prevention	Cardio-metabolic
Claudication	Cardio-metabolic
CVA/TIA	Cardio-metabolic
Diabetes (I/II/IGT)	Cardio-metabolic
Dietary Related	Cardio-metabolic
Falls prevention	Musculoskeletal
Hip Replacement	Musculoskeletal
Hyperlipidemia	Cardio-metabolic
Hypertension	Cardio-metabolic
IBS	Other
Laproscopic gastric bypass	Other
Mental health, severe/non severe and non acute	Mental health
Muscle Injury	Musculoskeletal
Neurological (Inc. Epilepsy)	Other
Non Stated	Other
Osteoporosis	MSK
Osteoporosis Prevention	MSK
Other (inc dietary problems)	Other
Parkinsons	Other
Post Natal	Musculoskeletal
Rheumatoid Arthritis	Musculoskeletal
Sedentary Unfit	Cardio-metabolic
Surgical preparation/Recovery (non cardiac)	Other
Ulcerative Colitis	Other
Weight Management	Cardio-metabolic
Wilson's Disease	Other

Appendix 3. Audit of removed data from analysis when testing differences between starters and non-starters, starters and finishers.

The following section is for Chi-Squared analysis, unless otherwise stated.

Gender
Finishers and non-finishers: Discarded “not stated” from analysis (n=40)

Referral tier
Finishers and non-finishers: Discarded “Not stated” from analysis (n=309). Discarded Pregnancy related referrals (n=67), to investigate for differences between at risk or low risk participant (Tier 2 vs 3).

Referral source
Finishers and non-finishers: Discarded “not stated” from analysis (n=52)

Disability status
Finishers and non-finishers: Discarded “Not stated” from analysis (n=662)

Referral type
Finishers and non-finishers: Maternity was discarded as only 1 referral.

Referral reason
Starters and finishers: Grouped referral reason into four groups, “other, did not start” did not violate assumptions and was included in analysis. Analysis only using the three other groups was also carried out for comparison to starters and non-starters.

Alcohol intake
No data removed.
Note: unable to carryout Chi-Squared analysis on alcohol/smoking for starter’s vs non-starters as no data for non-starters. Zero counts present in smoking therefore unable to carry out analysis

Age
Removed “not stated” (n =38) from starters, (n=23) from finishers. Independent T-test.

Appendix 4. Audit of removed data from logistic regression analysis

Logistic Regression 1 and Logistic Regression 2

Present at 6/52 versus Dropout at 6/52 or Present at 12/52 versus dropout at 12/52

Binary predictor variables or continuous variables only utilised. Data utilised for final analysis: Present/Not present, Gender, Age, Referral type, Referral source, Tier, Alcohol status, Smoking Status, PA level, BMI, 9 separate barriers.

Total number of participants in analysis: 3267
Multicollinearity checked using correlation matrix and multicollinearity statistic.

Method: Forced entry. All categorical variables set as first.

In order to gain binary variables, the following variables collapsed or data removed:

“Not stated” for gender (n=40)

“Not stated” for age (n=40)

“100+” for age (n=21)

“Not stated”/unrealistic BMI (n=41)

“Nutrition”, “Maternity” and “Not stated” for referral type (n=3246)

“Not stated” for referral source (n=49)

“Maternity” and “not stated” removed from tier (n=375)

“Not stated” from alcohol (n=3266). “Yes”, “Moderate”, “Hazardous” and “Harmful” collapsed together as “Yes, drinker”

“Not stated” removed for smoking (n=50). “yes”, “<9”, “10<19”, “>20” collapsed to “yes”.

Total of 3267 participants in regression (6796 total – 3529 removals)

Appendix 5. Chapter five ethics confirmation

Principal Investigator	**Michael Kelly**
Project Title	Exercise Referral Scheme: Participant's perceptions of barriers and facilitators to Exercise Referral Scheme adherence
Project Code (where applicable)	HLSMK060716
Date of original ethical approval	**13/7/16**
Date of amendment request	**13/2/17**

Description of Amendment:

1) **To use telephone calls to recruit for focus group interviews, as opposed to sending out postal recruitment packs. Recruitment will target adults, aged 18 years and above, all of which have completed the Exercise Referral Scheme (ERS).**
2) **Use staff at the ERS to hand out recruitment/ information sheets when participants have completed the scheme to support the recruitment drive for the focus groups. The recruitment/information sheet highlights the aims of the focus group and provides contact details for the participants to use, if they wish to declare their interest in participation (example is attached).**

Reasons for Amendment/Change:

1) **Using telephone recruitment for individual interviews has markedly increased recruitment rates with ERS participants, therefore instead of attempting postal recruitment which has not been successful, to change the method of recruitment to telephone calls.**
2) **When participants complete the scheme, they have a final assessment carried out by a member of the ERS staff. This is an opportunity to make participants aware of the ongoing research, and for the staff to provide an information sheet with contact details for the participants to use, should they be interested in participation. The manager of the scheme has agreed to this proposal and provided permission to ask the ERS staff to hand out the information sheets at the end of the final assessment.**

Anticipated Implications: Main anticipated implication is to increase recruitment levels for the study. From an ethical standpoint, there are no anticipated implications.

TO BE COMPLETED BY THE ETHICS COORDINATOR

Acceptance	Signature: M. Wilkinson Name: Mick Wilkinson
Date: 15/02/2017	

Appendix 6. Chapter five recruitment information.

Temple Park Wellness Centre
South Shields,
Tyne and Wear
NE34 8QN

Dear Sir/Madam:

I am currently carrying out research at Northumbria University and working with the South Tyneside Exercise Referral Scheme. This research has gained ethical approval from Northumbria University ethics committee, and your address has been obtained from the South Tyneside Exercise Referral Scheme database. As part of this research, we are trying to understand the viewpoints and experiences of people that have not been able to complete the exercise scheme. We have particular interest in understanding the views of people under the age of 55 years, as it appears that this group of people particularly struggle to complete the exercise scheme. The aim of this research is not to judge or question why people have not been able to complete the exercise scheme, but to understand what made it difficult to complete the scheme and what could be done to support completion of the scheme. By understanding this, it will be possible to help make changes to improve the exercise referral scheme.

The records within the Exercise Referral Scheme indicate that you were referred to the exercise scheme, but were unable to complete. As you are under 55 years old and therefore part of our highlighted group, we would be interested in hearing and understanding your views about the scheme, why it was not possible to complete the scheme, and how it could have been made easier for you to complete the scheme.

We are sending you this letter to invite you to participate in an interview with myself (which can be carried out at your home or at Temple Park Wellness Centre- whatever is convenient for yourself), lasting approximately 1 hour and audio-recorded. As recognition of the time you have taken to participate in the interview, you will be recompensed with a free swimming pass. I have attached a more detailed overview of the interviews within this letter. Should you be interested in taking part in the interviews, please read this information and return the reply slip back using the freepost envelope. Once this is received, I will be in contact to organise a time convenient for yourself to carry out the interview. If you have any questions at all, please feel free to contact me.

Sincerely

Michael Kelly- Lead Researcher

Faculty of Health & Life Sciences

Study Title: Participant's perceptions of barriers and facilitators to Exercise Referral Scheme adherence.

Investigator: Michael Kelly

Participant Information Sheet (interviews)

You are being invited to take part in this research study. Before you decide it is important for you to read this leaflet so you understand why the study is being carried out and what it will involve.

Reading this leaflet, discussing it with others or asking any questions you might have will help you decide whether or not you would like to take part.

What is the Purpose of the Study

Exercise Referral Schemes are commonly used as a way of helping people increase their physical activity levels. However, not all people who start the schemes are able to complete them. We would like to support people to complete the schemes, but currently, there is very limited information as to why people are not able to complete. To gain information, we would like to conduct one to one private interviews with people who have found themselves unable to complete the exercise referral scheme.
By carrying out individual interviews with people we hope to gain insight and understanding into the real life experiences of participating in exercise referral. The information gained from this study will be used to help improve the scheme. This research is being conducted as part of a PhD at Northumbria University.

Why have I been invited?

It is important to understand the viewpoints of people who have been enrolled or started the exercise scheme, but for whatever reason, have not been able to complete it. Research has indicated that people who are less than 55 years old are less likely to complete the scheme, and that most people who do not complete the scheme, stop attending within the first 6 weeks of the scheme.
You have been invited to be interviewed as you fall into this category. Your views on the scheme are valuable towards finding an understanding of why people may find it difficult to complete the scheme and how we can help to support participants.

Do I have to take part?

No, taking part in the interview is entirely voluntary. This information sheet is being provided to help you make a decision about taking part or not. If you do decide to take part, remember that you can stop being involved at any point, whenever you choose, without telling us why. You are completely free to decide whether or not to take part, or to take part and then leave the study before completion.

What will happen if I take part?

If you are interested in taking part, please fill out the reply form attached within this pack and send it back using the Freepost envelope provided.
Once we receive your reply, we will contact you via phone or email to organise a time, date and location of your choosing to carry out the interview. It is possible to conduct the interview at Temple Park Wellness Centre, however, if you wish, the interview can be conducted in your home.
The interview itself will be conducted by the lead researcher Michael Kelly, will last approximately 1 hour, and will be recorded using an audio recorder. The interview will be entirely anonymous, your name, address or any personal details will not be disclosed within the research. Your gender and age will be recorded, but it will not be possible to use this information to trace the interview details back to yourself. Once the interview is completed, you are not required to do anything else.

What are the possible disadvantages of taking part?

You will be using approximately one hour of your time, and you could possibly discuss reasons for not completing the exercise referral scheme that could make you uncomfortable. However, the interview is not aiming to "judge" you, the aim is to understand why it was not possible to complete the exercise scheme, to help improve the process for future participants.

What are the possible benefits of taking part?

You will be provided with a free swimming pass as reimbursement for your time. In addition, you will be helping provide valuable insight into why people are not always able to complete exercise referral schemes. By understanding this, it will be possible to help improve the exercise scheme, meaning people are able to increase their physical activity levels and health more easily.

Will my taking part in this study be kept confidential and anonymous?

Yes, it will not be possible for anyone to know that you are taking part in the study. All of your information will be confidential. Your name will not be written on the recorded interviews, or on the typed up versions of your discussions from the interview, and your name will not appear in any reports or documents resulting from this study. The consent form you have signed will be stored separately from your other data. The data collected from you in this study will be confidential. The only exception to this confidentiality is if the researcher feels that you or others may be harmed if information is not shared.

How will my data be stored?

The interview recording will be electronically saved and securely stored on the University U drive, which is password protected. Your consent forms will be stored separately, and securely in a locked office/filing cabinet. All data will be stored in accordance with University guidelines and the Data Protection Act (1998).

What will happen to the results of the study?

The findings from the study will be used within a PhD Thesis, and will likely be reported in a scientific journal or research conference. The results will be used to help inform a method of improving the exercise referral scheme. Bear in mind, that none of your personal information will be identifiable to anyone and you will always remain anonymous, whether the data is published in the PhD Thesis, journal or conference.

Who is Organizing and Funding the Study?

Northumbria University

Who has reviewed this study?

The Faculty of Health and Life Sciences Research Ethics Committee at Northumbria University have reviewed the study in order to safeguard your interests, and have granted approval to conduct the study. The South Tyneside Exercise Referral Scheme have reviewed this study and granted permission

Contact for further information:

Researcher:
Michel Kelly michael4.kelly@northumbria.ac.uk

Exercise Referral Scheme Manger:
Diane Walker Diane.Walker@southtyneside.gov.uk

Faculty of Health & Life Sciences

Study Title: Participant's perceptions of barriers and facilitators to Exercise Referral Scheme adherence.
Investigator: Michael Kelly

Participant Information Sheet (Focus group)

You are being invited to take part in this research study. Before you decide it is important for you to read this leaflet so you understand why the study is being carried out and what it will involve.

Reading this leaflet, discussing it with others or asking any questions you might have will help you decide whether or not you would like to take part.

What is the Purpose of the Study

Exercise Referral Schemes are commonly used as a way of helping people increase their physical activity levels. Currently there is very little research that has helped understand why and how people can complete the schemes. This study aims to bring together a group of people who have completed an Exercise Referral Scheme into a focus group, and discuss their shared experience of the scheme. The information gained from this study will be used to help further improve the scheme. This research is being conducted as part of a PhD at Northumbria University.

Why have I been invited?

You have been invited to this focus group, as you have successfully completed the exercise referral scheme to discuss your experiences of the scheme. This will help highlight any barriers, that you may have had and overcome, or any influences that facilitated your completion of the scheme. There is very limited evidence within the scientific literature, which helps explain how and why people are able to complete exercise referral schemes. As you have completed the scheme, you are in an ideal position to help discuss what the scheme was like to experience.

Do I have to take part?

No, taking part in the study is entirely voluntary. This information sheet is being provided to help you make a decision about taking part or not. If you do decide to take part, remember that you can stop being involved at any point, whenever you choose, without telling us why. You are completely free to decide whether or not to take part, or to take part and then leave the study before completion.

What will happen if I take part?

If you are interested in taking part, please fill out the reply form attached within this pack and send it back using the Freepost envelope provided.
Once we receive your reply, we will contact you via phone or email to organise a time and date to carry out the focus group at Temple Park Wellness Centre. The focus group itself will be conducted by the lead researcher Michael Kelly, will last approximately 1-1.5 hours, and will be recorded using an audio recorder. There will be 6-8 other people, like you, that have completed the exercise referral scheme and shared the same barriers to exercise. The focus group audio recording will be entirely anonymous, your name, address or any personal details will not be disclosed within the research. Your gender and age will be recorded, but it will not be possible use this information to trace the focus group details back to yourself. Once the focus group is completed, you are not required to do anything else.

What are the possible disadvantages of taking part?

You will be using approximately one hour of your time, and you could possibly discuss barriers to exercise with a group of strangers that could make you uncomfortable. However, the focus group is not aiming to "judge" you, the aim is to understand how a similar group of people successfully managed to complete an exercise scheme despite having similar barriers that could stop them from completing.

What are the possible benefits of taking part?

You will be provided with a free swimming pass as reimbursement for your time. In addition, you will be helping provide valuable insight into why people are able to complete exercise referral schemes, despite having barriers that could inhibit completion. By understanding this, it will be possible to help further improve the exercise scheme, meaning more people are able to increase their physical activity levels and health more easily.

Will my taking part in this study be kept confidential and anonymous?

Yes, it will not be possible for anyone to know that you are taking part in the study. All of your information will be confidential. Your name will not be written on the recorded interviews, or on the typed up versions of your discussions from the interview, and your name will not appear in any reports or documents resulting from this study. The consent form you have signed will be stored separately from your other data. The data collected from you in this study will be confidential. The only exception to this confidentiality is if the researcher feels that you or others may be harmed if information is not shared.

How will my data be stored?

The interview recording will be electronically saved and securely stored on the University U drive, which is password protected. Your consent forms will be stored separately, and securely in a locked office/filing cabinet. All data will be stored in accordance with University guidelines and the Data Protection Act (1998).

What will happen to the results of the study?

The findings from the study will be used within a PhD Thesis, and will likely be reported in a scientific journal or research conference. The results will be used to help inform a method of improving the exercise referral scheme. Bear in mind, that none of your personal informational will be identifiable to anyone and will always remain anonymous, whether the data is published in the PhD Thesis, journal or conference.

Who is Organizing and Funding the Study?

Northumbria University

Who has reviewed this study?

The Faculty of Health and Life Sciences Research Ethics Committee at Northumbria University have reviewed the study in order to safeguard your interests, and have granted approval to conduct the study. The South Tyneside Exercise Referral Scheme have reviewed this study and granted permission

Contact for further information:

Researcher:
Michel Kelly michael4.kelly@northumbria.ac.uk

Exercise Referral Scheme Manger:
Diane Walker Diane.Walker@southtyneside.gov.uk

northumbria
UNIVERSITY NEWCASTLE
Faculty of Health & Life Sciences

FOR USE WHEN PHOTOGRAPHS/VIDEOS/TAPE RECORDINGS WILL BE TAKEN

Project title: Exercise Referral Scheme: Participant's perceptions of barriers and facilitators to Exercise Referral Scheme adherence.

Principal Investigator: Michael Kelly

I hereby confirm that I give consent for the following recordings to be made:

Recording	Purpose	Consent
voice recordings	For transcription and analysis of themes relating to the barriers or facilitators of adhering to an Exercise Referral Scheme	

Clause A: I understand that other individuals may be exposed to the recording(s) for transcription and analysis purposes only. These processes will not allow any association with myself or the recordings. My name or other personal information will never be associated with the recording(s).

Tick or initial the box to indicate your consent to Clause A ☐

Clause B: I understand that the recording(s) may also be used for teaching/research purposes and may be presented to students/researchers in an educational/research context. My name or other personal information will never be associated with the recording(s).

Tick or initial the box to indicate your consent to Clause B ☐

Clause C: I understand that the recording(s) may be published in an appropriate journal/textbook or on an appropriate Northumbria University webpage, which would automatically mean that the recordings would potentially be available worldwide. My name or other personal information will never be associated with the recording(s). I understand that I have the right to withdraw consent at any time prior to publication, but that once the recording(s) are in the public domain there may be no opportunity for the effective withdrawal of consent.

Tick or initial the box to indicate your consent to Clause C ☐

Signature of participant..... Date.....……..

Signature of researcher..... Date.....……..

Participant code:

PARTICIPANT DEBRIEF (interviews)

Name of Researcher: Michael Kelly

Name of Supervisor: Nick Caplan

Project Title: Participant's perceptions of barriers and facilitators to Exercise Referral Scheme adherence.

1. **What was the purpose of the project?** To investigate the views of people that have started, but not completed the Exercise Referral Scheme. Research has indicated that people under 55 years old are less likely to complete the scheme. In addition to this, most people cease attending the scheme within the first 6 weeks of the scheme starting. Research explaining why this appears to be the case is very limited. This study aimed to provide insight primarily into the difficulties people have in trying to complete the exercise referral scheme, but to also specifically focus upon a group (those under 55 years old) which appears to complete the schemes less often than other groups. The findings from this study will provide insight into possible ways of improving the exercise referral scheme, in order to facilitate the completion of the schemes by those under 55 years old.

2. **How will I find out about the results?** The data from the interviews will be transcribed, then analysed, looking for patterns between each participant. In order to fully analyse each participants interview and cross reference each interview, it is anticipated that the results will be completed by approximately late 2017. Once the results have been written up, a general review of the findings will be available for you. In order to gain a copy, email the lead researcher Michael Kelly (michael4.kelly@northumbria.ac.uk) and a copy will be sent to you.

3. If I change my mind and wish to withdraw the information I have provided; how do I do this? If you wish to withdraw your data, then email the investigator named in the information sheet within 1 month of taking part and give them the code number that was allocated to you (this can be found on your debrief sheet). After this time, it might not be possible to withdraw your data as it could already have been analysed.

The data collected in this study may also be published in scientific journals or presented at conferences. Information and data gathered during this research study will only be available to the research team identified in the information sheet. Should the research be presented or published in any form, all data will be anonymous (i.e. your personal information or data will not be identifiable).

All information and data gathered during this research will be stored in line with the Data Protection Act and will be destroyed **36** months following the conclusion of the PhD (completion due 1/2/2020). If the research is published in a scientific journal it may be kept for longer before being destroyed. During that time the data may be used by members of the research team only for purposes appropriate to the research question, but at no point

will your personal information or data be revealed. Insurance companies and employers will not be given any individual's personal information, nor any data provided by them, and nor will we allow access to the police, security services, social services, relatives or lawyers, unless forced to do so by the courts.

If you wish to receive feedback about the findings of this research study then please contact the researcher at **michael4.kelly@northumbria.ac.uk**

This study and its protocol have received full ethical approval from Faculty of Health and Life Sciences Research Ethics Committee. If you require confirmation of this, or if you have any concerns or worries concerning this research, or if you wish to register a complaint, please contact the Chair of this Committee (Dr Nick Neave: nick.neave@northumbria.ac.uk), stating the title of the research project and the name of the researcher:

Participant code:	**PARTICIPANT DEBRIEF (Focus group)**

Name of Researcher: Michael Kelly

Name of Supervisor: Nick Caplan

Project Title: Participant's perceptions of barriers and facilitators to Exercise Referral Scheme adherence.

1. What was the purpose of the project? To investigate the views of people that have successfully completed the Exercise Referral Scheme. It may be possible to use the findings from this study to help future participants embarking on the scheme, by providing them with information/tips and experience from those that have successfully completed the scheme. In terms of research, very little is known in terms peoples experiences of exercise schemes, and this study will start the process of investigating this area.

2. How will I find out about the results? The data from the focus groups will be transcribed, then analysed, looking for patterns between each participant. In order to fully analyse the focus group, it is anticipated that the results could approximately be completed by September 2017. Once the results have been written up, a general review of the findings will be available for you. In order to gain a copy, email the lead researcher Michael Kelly (michael4.kelly@northumbria.ac.uk) and a copy will be sent back.

3. If I change my mind and wish to withdraw the information I have provided; how do I do this? If you wish to withdraw your data, then email the investigator named in the information sheet within 1 month of taking part and given them the code number that was allocated to you (this can be found on your debrief sheet). After this time, it might not be possible to withdraw your data as it could already have been analysed.

The data collected in this study may also be published in scientific journals or presented at conferences. Information and data gathered during this research study will only be available to the research team identified in the information sheet. Should the research be presented or published in any form, all data will be anonymous (i.e. your personal information or data will not be identifiable).

All information and data gathered during this research will be stored in line with the Data Protection Act and will be destroyed **36** months following the conclusion of the PhD (Completion due 1/2/2020). If the research is published in a scientific journal it may be kept for longer before being destroyed. During that time the data may be used by members of the research team only for purposes appropriate to the research question, but at no point will your personal information or data be revealed. Insurance companies and employers will not be given any individual's personal information, nor any data provided by them,

and nor will we allow access to the police, security services, social services, relatives or lawyers, unless forced to do so by the courts.

If you wish to receive feedback about the findings of this research study then please contact the researcher at **michael4.kelly@northumbria.ac.uk@northumbria.ac.uk**

This study and its protocol have received full ethical approval from Faculty of Health and Life Sciences Research Ethics Committee. If you require confirmation of this, or if you have any concerns or worries concerning this research, or if you wish to register a complaint, please contact the Chair of this Committee (Dr Nick Neave: nick.neave@northumbria.ac.uk), stating the title of the research project and the name of the researcher:

Appendix 7. Telephone Interview topic schedule

MK: Hello, I am Michael Kelly from Northumbria University and I am working with South Tyneside Exercise Referral Scheme. We are interested in speaking to people who have been involved within the scheme and our aim is to make the scheme as effective as possible for as many people as possible. We are only able to do this by speaking to people who have recently experienced the scheme, therefore we are contacting people who have been involved in the scheme to help us understand their experiences. Would you be able to chat about your experiences within an interview to help us? For your time, we can send you a free swimming voucher.

PT: (Response 1) No…

MK: Ok, thank you for your time.

PT: (Response 2) Yes…

MK: Thank you. We are particularly interested in speaking to people who have not completed the scheme. We want to improve the scheme so that it is more fit for purpose and more people are able to engage with it. The purpose of this interview is to understand your experience of the scheme: what worked for you and what didn't, what led to you dropping out and what we could have done better support you to stay involved with the scheme.

We have already carried out some research and have found that most people drop out of the scheme within the first 6 weeks and are under 55 years old. Our records show that you fit within this group. Can you confirm that this is the case?

The interview will take no longer than one hour. The interview will be recorded and all of your information will be entirely anonymous. The data from your interview will be compiled together with other interviews to help understand why people do not complete the scheme. The interview can be carried out today if you wish, at a later date over the phone, or in person. If you wish to participate today, I will need to gain consent verbally. Following the interview, I will email (or post) out a debrief information sheet for you with my contact details should you have any questions.

You are free to withdraw from the interview at point.

Do you have any questions at this point?

If you are happy to start the interview, can I have your permission to start recording to first gain consent which will involve me reading out the main areas of consent? If yes…go to line 59.

If you would prefer to carry out the interview at another time, we can arrange a telephone interview, or we can carry out the interview in person, either at your home or at Temple Park Wellness centre (see responses 3 or 4)

PT: (Response 3) Can I arrange another phonecall interview?

MK: Yes, can I record your number and email (or postal address) to send out the consent forms please?

Gain PT's details. Arrange time and date for call. Send out consent and information forms.

During arranged interview: If patient has received the consent form, ask if they understand it. Gain consent to start recording, start recording and ask do they understand the consent form and do they provide consent to start the interview.

Start interview…

PT: (Response 4) Can we arrange a face to face interview?

MK: Yes, can I record your number and email (or postal address) to send out the consent forms please?

Gain PT details, Arrange time, date and location. Send out consent form.

PT: Yes, can we carry out the interview now?

[Start recording]

MK: The following describes how the data may be used:

The data recorded may be exposed to other individuals for the purposes of transcription and analysis. The data may be used for teaching/research purposes and may be presented to students/researchers in an educational/research context. The data may be published in an appropriate journal/textbook or on an appropriate Northumbria University webpage, which would automatically mean that the data would potentially be available worldwide. Before any data is made available to anyone, all of your personal details and information will be removed and you will never be associated with the data. You have the right to withdraw at any time prior to the data being published, but once the data has been published it may not be possible to withdraw the data. Please be reassured however all data will be anonymous.

Do you understand the above points, and do you give consent for this interview to be recorded, for the purpose of transcription and analysis of the themes relating to the barriers or facilitators of adhering to an Exercise Referral Scheme?

PT: Yes I agree…

MK: This is interview number #, recorded on (date).

Start of interview…

Possible questions to consider from participant: “How did you get my number?”.

I am working with the exercise referral scheme, to help improve the scheme. As part of this, we have ethical clearance and permission to access and analyse the data collected within the scheme, including contact details for the purpose of research.

Appendix 8. Interview Reflexivity

Ritchie et al. (2014) suggest that reflexivity is used to support empathetic neutrality within the conduct of research. This is to understand that the researcher(s) own beliefs, role and behaviours can influence the research process. The researcher should be sensitive to how the data was collected and shaped, in relation to the methods in which it was collected (Mays and Pope, 2000). It is important to highlight personal or intellectual bias, prior assumptions and experiences to enhance the credibility of the research findings (Mays and Pope, 2000, Mays and Pope, 2006, p. 89). Reflexive activity was conducted following the first face-face and telephone interviews. This was conducted at this time, as this was the first point of the thesis whereby the researcher had most influence into the research process. Although the first phase (chapter 4) was conceived and conducted by the researcher, the analysis employed were based on statistical tests, using limited levels of subjectivity, therefore reflexivity was employed in an informal manner. However, for the second phase (Chapter 5), the development and conduct of qualitative research can be influenced more easily by the researcher's questions, style of interviewing and interpretations, all of which are potentially influenced by the researcher's beliefs and biases. Therefore, a reflective activity was undertaken following formally during this phase of the thesis.

The researcher

I was a graduate Tutor of Physiotherapy, working at Northumbria University and at the start of this phase of the research had been employed in this role for 20 months. Prior to this role, I was a Senior Musculoskeletal Physiotherapist with over 5 years clinical experience. Prior to the PhD, I had no experience of working within or with Exercise Referral Schemes, but had previously referred patients into schemes on a very limited basis while working clinically. However, none of the patients that where referred, were from, or referred to the South Tyneside region. My contact with the ERS prior to the second phase (chapter 5), was limited to the ERS staff only, and was a statistical analysis of the predictors and barriers for ERS adherence.

My biases and prior experience were a potential source of bias during the research process. In clinical practice, I had a strong bias towards providing tailored and progressive exercise, in conjunction with contemporary and evidence based education when treating and managing patients. Therefore, promoting the benefits

of exercise, and debunking inaccurate myths regarding conditions, such as low back pain were viewed as important parts of my role as a clinician.

Face to face interview #1

Within the first interview, the interviewee made various comments and points regarding her pain/symptoms and particular diagnosis, with an emphasis on how the diagnosis could have been, and should have been managed. My professional status as a Physiotherapist and Lecturer made me want to correct some of the misconceptions of the participants. It was difficult to avoid the temptation to revert to my role as a Physiotherapist, and provide more accurate information, to help her understand her low back pain. However, as the role of the researcher was to conduct research and not treat the participant, it was important to not allow this to influence the interview. The participant was not aware of the researcher's training or role (as an Musculoskeletal Physiotherapist), and this first interview reinforced the importance of only disclosing the researcher's role as a researcher, due to the possibility of changing the dynamic of the interview, which could have been an issue if the participant understood the researcher's profession/background. I was successful in avoiding biasing the interview, by ensuring I was not asking questions as a physiotherapist, the reflection did highlight the importance of achieving "emphatic neutrality" (Ormston et al., 2014, p. 2) to avoid conscious bias. While the researcher had a bias towards supporting physical activity, this topic also needed to be approached from a neutral perceptive during the interviews and needed to be reflected upon, as to limit the introduction of potential bias during the interviews.

Telephone interview #1

It was anticipated that follow-up questions may have needed to be more explicit due to the lack of nonverbal cues (Cachia and Millward, 2011). However this proved not to be the case, and following up questions or probing, was not an issue, because changes in tone or hesitation for example could be picked up during the telephone interview.

Interview progression

Following the first interview, the main reflective points related to the participant's understanding of back pain and its causes. Her understanding was in some

instances, at odds with the current evidence base, and this misconception appeared to be hindering her approach to physical activity. As the researcher (MK) was a qualified Physiotherapist, specialising in Musculoskeletal Physiotherapy, I needed to be wary of my initial reaction to correct inaccurate understanding of varying conditions, or be viewed by the participants as someone who was “pushing” the notion of increasing physical activity or exercise. I was also aware, that I needed to be viewed as neutral, in terms of any potential alliances with the ERS itself, in order to gain open and honest views form the participants about their experiences within the scheme. As each interview was conducted, and each transaction completed, I was able to review if any of my biases came into the interviews. I do not feel they influenced the questions, or how the questions were asked. However, one of the codes generated during the analysis, the code “MSK Misconception” was impacted by my bias. This related to a participants misconception of a diagnosis or condition, and would not have been coded by another researcher that was not educated or have an understanding of musculoskeletal conditions. Interestingly, this code was also agreed upon by my supervisor, who is also a Physiotherapist.

Appendix 9. Interview Codes and Categories

Code	Categories	Code	Categories
Bureaucratic miscommunication Expectations not met Feeling uncomfortable in gym Feeling uncomfortable with being weighed Felt class was not appropriate Inconsistent point of contact Initial referral thoughts (-ve) Issue with Gym based ERS Lack of collaboration Lack of continuity in ERS Lack of rapport Lack of support Lack of Tailoring Loss of trust Miscommunication-Lack of communication Negative experience New medical condition limiting ERS Pain started-increased with ERS Reason for dropout Unexpected ERS suggestion (-ve) -ve feelings towards ERS Worsening of referral problems	Understand why participants drop out of the scheme.	Barrier Childcare issue ERS time-scheduling issues Explanations for under 55s dropout rate Financial benefits of scheme Method of dropout Motivation issue Not enough time Persistent pain Positives of scheme Possible motivation issue Preferences related to exercise Prior condition-injury-Dx impacting on ERS Referral reason Referral time-experience (+ve) Referral time-experience (-ve) Self directed exercise examples Self motivation for exercise Staff information supporting PA levels Time inactive Time to gain Assessment (-ve) Trusting the professional Unexpected ERS suggestion (+ve) Useful advice +ve -ve followup experience	Increasing the understanding of what the barriers and facilitators to ERS adherence are.
Gym seen as +ve Happy with times offered for classes Initial referral thoughts (+ve) MSK misconception	To explore why the barriers and facilitators are present.	If reason for drop out removed, would you complete it Missed education opportunity Scheme followup suggestions-mental health Scope for tailored classes Social support could be beneficial Suggestions to improve ERS Value of variety could improve scheme	To explore how ex participants would improve the scheme for future participants

+ve experience with staff +ve motivation from staff Alternatives to ERS Benefit of ERS despite dropout Benefits of alternative to ERS Benefits of classes Benefits of ERS Desired PA methods Levels of PA pre ERS Motivation technique-self talk Negatives of ERS alternatives Non- ERS support-Help Offering alternatives when dropping out PA modes/levels post ERS dropout Participants aims Perseverance despite -ve ERS experience Point of dropout Reason for inactivity- pre ERS Reasons for exercising generally	To explore how to overcome/facilitate overcoming the barriers and enhance the facilitators.	+ve experience with staff Benefits of ERS Financial benefits of scheme Gym seen as +ve Happy with times offered for classes Offering alternatives when dropping out Suggestions to improve ERS Time to gain Assessment (-ve) Trusting the professional Unexpected ERS suggestion (+ve) +ve motivation from staff Benefit of ERS despite dropout Feeling uncomfortable in gym Feeling uncomfortable with being weighed Initial referral thoughts (+ve) Initial referral thoughts (-ve) Lack of collaboration Lack of continuity in ERS Lack of rapport lack of support Lack of Tailoring Loss of trust Negative experience Reason for dropout Referral time-experience (+ve) Referral time-experience (-ve) Staff information supporting PA levels Unexpected ERS suggestion (-ve) Useful advice +ve -ve feelings towards ERS -ve followup experience Felt class was not appropriate Issue with Gym based ERS	The experience: what was the ERS like?
Barrier Benefit of ERS despite dropout Childcare issue Explanations for under 55s dropout rate Feeling uncomfortable in gym	The dropout – the process, reasons, and method	Aims to support employment Alternatives to ERS Benefits of alternative to ERS Benefits of classes Desired PA methods	Preferences: what do people want?

Feeling uncomfortable with being weighed If reason for drop out removed, would you complete it Method of dropout Motivation issue Negative experience Not enough time Point of dropout Reason for dropout Unexpected ERS suggestion (-ve) -ve feelings towards ERS -ve followup experience Felt class was not appropriate Inconsistent point of contact Issue with Gym based ERS New medical condition limiting ERS Persistent pain Prior condition-injury-Dx impacting on ERS		Positives of scheme Preferences related to exercise Reasons for exercising generally Specific expectations Benefits of ERS Expectations not met Happy with times offered for classes Participants aims Scheme followup suggestions-mental health Scope for tailored classes Suggestions to improve ERS Lack of collaboration Lack of continuity in ERS Lack of rapport lack of support Lack of Tailoring Referral time-experience (+ve)	
+ve motivation from staff Awareness of gym times bureaucratic miscommunication Miscommunication-Lack of communication Missed education opportunity Participants aims Scheme followup suggestions-mental health Scheme followed up after non-attendance Scope for tailored classes Staff information supporting PA levels Useful advice +ve	Communication and data: Communication, miscommunication and bureaucratic processes	ERS time-scheduling issues Expectations not met Felt class was not appropriate Inconsistent point of contact Issue with Gym based ERS Lack of collaboration Lack of continuity in ERS Lack of rapport lack of support Lack of Tailoring Loss of trust	Perceptions of ERS deficiencies
Awareness of gym times Desired PA methods ERS time-scheduling issues Expectations not met Expert social support Feeling uncomfortable in gym Feeling uncomfortable with being weighed Felt class was not appropriate Happy with times offered for classes Issue with Gym based ERS	Fitting the individual- tailoring, time, exercise	Aims to support employment Benefits of alternative to ERS Motivation technique-self talk Preferences related to exercise Reasons for exercising generally Recognition of low PA levels Recognition of Physical issue Self directed exercise examples Self motivation for exercise Social benefits of ERS alternative (Aquafit)	Taking control- Participants taking control of PA

Lack of collaboration Lack of continuity in ERS Lack of rapport lack of support Lack of Tailoring Miscommunication-Lack of communication Missed education opportunity Offering alternatives when dropping out Participants aims Preferences related to exercise Scope for tailored classes Self motivation for exercise Specific expectations Suggestions to improve ERS Useful advice +ve Value of variety could improve scheme		Specific expectations	

Levels of PA pre ERS No PA prior PA levels-modes in non-recent past PA modes/levels post ERS dropout Physical-Exercise limitation Reason for inactivity- pre ERS Recognition of low PA levels Recognition of Physical issue	PA levels, modalities and descriptions	Aims to support employment Assessment detail(s) Awareness of gym times Expert social support Historical ERS experience How first heard of ERS No PA prior PA levels-modes in non-recent past Physical-Exercise limitation Recognition of low PA levels Recognition of Physical issue Referral process- secondary care Referral source Referrers expectations-goals-aims Scheme followed up after non-attendance Secondary care Exercise prior to ERS Social benefits of ERS alternative (Aquafit) Specific expectations Uncommon ref source-reason Would Physio input help	Other

Assessment detail(s) Historical ERS experience How first heard of ERS Initial referral thoughts (+ve) Initial referral thoughts (-ve) Referral process- secondary care Referral reason Referral source Referral time-experience (+ve) Referral time-experience (-ve) Referrers expectations-goals-aims	The referral- The process from referral to assessment	New medical condition limiting ERS Pain started-increased with ERS Persistent pain Prior condition-injury-Dx impacting on ERS Worsening of referral problems	Pain: past, present or increased, including additional diagnosis

Appendix 10. Chapter seven educational pamphlet

Appendix 10. Educational pamphlet

Northumbria University NEWCASTLE

About this pamphlet

This pamphlet was produced using the feedback from people who attended the South Tyneside Exercise Referral Scheme. We listened to their suggestions, and what they wanted to have support with. We listened to people who had successfully increased their physical activity and gained significant health benefits as a consequence. We learned from their experiences, what they felt helped them and this has informed each part of this pamphlet.

What did we learn specifically?

- That people want to know more about exercise so they can tailor their own exercise to their own lives.
- That people want more nutritional advice.
- That people don't just want to exercise in the gym– they want more options than that!
- That those making successful transitions into a more active lifestyle understood and could see the benefits of exercise and physical activity.
- That people liked to see and track the progress they had made more clearly.

Extra information?

https://www.nhs.uk/Livewell/fitness/Pages/whybeactive.aspx

https://www.nhs.uk/Livewell/fitness/Pages/physical-activity-guidelines-for-adults.aspx

http://www.who.int/mediacentre/factsheets/fs385/en/

https://www.nhs.uk/conditions/nhs-fitness-studio/?tabname=aerobic-exercise

https://www.nhs.uk/Livewell/Goodfood/Pages/the-eatwell-guide.aspx

https://www.southtyneside.gov.uk/article/35917/Health

Questions?
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get active.

Community Exercise-

Healthy support for Healthy Lives

Making exercise and physical activity Simple

South Tyneside Council

Northumbria University NEWCASTLE

a better ü

What does this pamphlet aim to do?

The aim of this pamphlet is to support your physical activity. We want to help you keep active, healthy, and most importantly, be able to enjoy the benefits of an active lifestyle.

However, with conflicting information about physical activity and a busy lifestyle, at times it may seem difficult to fit exercise in! Within this pamphlet, you will find suggestions of how to make this as simple and easy as possible!

As you have already started the healthy lives fitness classes, this pamphlet is here to support your progress.

I have started exercising, so what are the benefits?

Physical activity has been shown to:

- Increase your muscular fitness
- Increase your heart and lung fitness
- Increase your general wellbeing and improve performance of everyday tasks
- Increase your enjoyment of using your body

Physical activity helps improve the symptoms of:

- Osteoarthritis
- Joint pain

Physical activity reduces the risk of developing:

- High blood pressure
- Heart disease
- Stroke
- Diabetes
- Cancer
- Depression

flexible solutions for...

Keeping active

What are the recommended level of exercise?

The best part of exercise? There are many ways of gaining the benefits! Below are the different ways of maintaining a healthy level of physical activity...

Be active daily with:

- 150 minutes of moderate aerobic activity per week **and** strength exercises on 2 or more days a week.

Or

- 75 minutes of vigorous aerobic activity per week **and** strength exercises on 2 or more days a week.

Or

- A mix of moderate and vigorous aerobic activity each week **and** Strength exercises on two or more days per week

So what does physical activity look like?

The good news, is that you have already seen examples of moderate exercise within the healthy lives classes!

Q: Are there other examples of moderate exercise?

A: Brisk walking, bike riding, mowing the lawn,

Q: What is vigorous activity?

A: This could be in the form of jogging, swimming, skipping,... why not try the couch to 5k challenge?

Q: What are strength exercises?

A: Exercises that provide resistance...lifting loads, weights, stepping, digging or shovelling

Q: Mix of moderate and vigorous aerobic activity... what do you mean?

A: 2x30 minute runs, plus 30 minutes of brisk walking.

How do I remember to keep active?

Easy gains...

Remembering to make the most of physical activity opportunities is a great way of making easy gains and hitting your goals

How?

- Put an alarm on your phone to remind you of the fitness classes
- Keep your clean exercise clothes by the door or in the car so you wont forget them
- Walk to work, or get off a few stops earlier... use this to increase your activity levels without too much effort required to remember!

I'm busy and can only make it to some classes...

It is possible to exercise anywhere!

While the food is in the oven...

...go for a walk or a jog

Cant leave the house?

- Why not exercise in the livingroom with children and grandchildren?
- Stuck for ideas of how to exercise in the house?
- Use what you have learned in the fitness classes
- See NHS aerobic exercise class video online*
- Use everyday reminders to do an activity when you see it...
- While waiting for the kettle to boil, or food to cook... why not squat, sit to stand or jog on the spot? If you have the space, try press-ups or lunges! Specialist equipment is not required!
- Making a hot drink...

Brushing teeth...

Going to work... all opportunities for activity

* link at back of pamphlet

Goals and goal setting

Setting realistic and measureable goals is an effective way of increasing and maintaining your activity levels.

A simple goal is:

Attend one fitness class per week, and complete 2x30 min jogs

Or

Maintain/reduce bodyweight by 0.5kg over the next week.

You can set goals alongside attendance to the exercise classes. What is a meaningful aim for you? What would you like to achieve? Remember– being consistent with physical activity is more important than going from nothing at all to too much.

How can you use goal setting to maintain you physical activity levels?

What are your goals?

Goal 1:_____

Goal 2:_____

How can you measure them?

_____

How many calories and what should I eat?

A simple guide is that a female should consume 2,000 and a male 2,500 calories per day to maintain weight. If you consume more than this, the likelihood is that you will gain weight, or at least find it harder to lose weight.

A simple way of managing calories is to use "400-600-600"

400 calories at breakfast, 600 at lunch and 600 for dinner. This leaves room for small snacks!

But how big is a 400 calorie breakfast? Or a 600 calorie lunch?

400 calories for breakfast: One pot (24g) of porridge or One poached egg on a muffin

600 calories for lunch: One bowl (200g) whole wheat pasta with tomato sauce or a 200g chicken and salad wrap

600 calories for dinner: 530g of homemade chicken curry, including 180g of rice.

Activity tracker

Goal setting is very useful.

A simple way of measuring your progress towards a goal is by tracking it.

- On the opposite page is an activity tracker. This is a simple way of planning and measuring what activity you have carried out.
- Use the "Goal(s)" column to plan your weekly Physical activity plan.
- Note down any specific reminders you can use to ensure you carry out the activity: i.e. squat while kettle is boiling
- Tally up all of your physical activity for each day and the week
- This is a simple and easy way to help keeping active and track your progress

Day	Goal(s)	Reminders	Activity (time)
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			
Total (mins)			

Meals and meal planner/tracker

Planning and recording your weekly meals is a great way of keeping to the 400-600-600 calorie goal.

The meal planner on the next page is a simple method of planning and recording your calorie intake.

A simple rule of thumb when designing a meal is to:

- Have 1/3 of your meal made of wholegrain or wholemeal starch.
- 1/3 should be vegetables,
- and the final 1/3, made up of proteins (i.e. fish/chicken) and dairy.

For more details visit the NHS website. Not only does it provide useful advice, it also offers free downloads to track plan your meals:

https://www.nhs.uk/oneyou/eating#LXhySxbzIjU0u3fV.97

Day	Breakfast	Lunch	Dinner	Snacks	Total (cals)
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

Appendix 11. Chapter seven ethics confirmation

FORM TO AMEND AN APPROVED PROJECT

Principal Investigator	**Michael Kelly**
Project Title	**Implementation of an evidence based education pamphlet within healthy lives fitness classes: A pilot quasi-experimental trial**
Project Code (where applicable)	**9325**
Date of original ethical approval	**3/5/18**
Date of amendment request	**15/5/18**

Description of Amendment: Change inclusion criteria from "*Must be a member of the healthy lives fitness classes and therefore possess a membership swipe card"… to "Must be a member of the healthy lives fitness classes".*

Reasons for Amendment/Change:

Key aims of the pilot study are:

1) Assess the recruitment, retention and outcome completion of participants using the educational pamphlet.
2) Assess if the introduction of the educational pamphlet has an impact on fitness class attendance and Patient Activation Measure (PAM score- this a questionnaire)

Attendance is measured using swipe card to exercise facility. Swipe card use for the facility is now not mandatory and many attendees do not swipe in, meaning attendance cannot be measured. The issue with this is that many people who volunteered to be recruited, were excluded due to the previous inclusion criteria. Although part of the key aims of the pilot is to assess the recruitment, this unexpected change in policy within the exercise classes regarding the swipe card, has had an unexpected impact on the ability to recruit, and isnt due to a lack of participants wanting to be recruited. If this can be amended to allow those without a swipe card to complete a PAM questionnaire and gain a pamphlet, part of the key aims can still be assessed, albeit without as many data on attendance to the classes.

Anticipated Implications: A minor change in the inclusion criteria, will allow a more robust assessment of the PAM score and use of the educational pamphlet. For example, 20 people volunteered to take part, only 7 could as they had swipe cards, leaving 13 people who could not be recruited and provide data on the PAM questionnaire. This minor change will help recruitment and support the investigation into the PAM questionnaire.

TO BE COMPLETED BY THE ETHICS COORDINATOR

Acceptance (Circle as appropriate)	Signature: M. Wilkinson Name: Mick Wilkinson
Date: 17/05/18	

Appendix 12. Kelly et al., (2016) publication

Journal of Public Health Advance Access published November 29, 2016

Journal of Public Health | pp. 1–8 | doi:10.1093/pubmed/fdw122

Retrospective cohort study of the South Tyneside Exercise Referral Scheme 2009–14: predictors of dropout and barriers to adherence

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ABSTRACT

Background Exercise Referral Schemes (ERS) are a prevalent method of increasing physical activity levels. However, they suffer from participant dropout and research predicting dropout or barriers to adherence are limited. This study aimed to focus upon the effect of referral characteristics on dropout, dropout predictors and whether self-reported barriers to exercise predict dropout.

Methods ERS data from 2009 to 2014 were retrieved for analysis. Chi-squared and *t*-tests were used to investigate differences between referral characteristics, and logistic regression used to investigate dropout predictors.

Results Of 6894 participants, 37.8% (n = 2608) dropped out within 6 weeks and 50.03% (n = 3449) by the final 12th week. More males adhered ($P < 0.001$) with dropouts being significantly younger ($P < 0.001$). Dropout predictors were smoking (OR = 1.58, 95% CI: 1.29–1.93) or being a Tier 3 referral (OR = 1.47, 95% CI: 1.25–1.73). Increasing age (OR = 0.98, 95% CI: 0.98–0.99), drinking alcohol (OR = 0.82, 95% CI: 0.71–0.95), secondary care referrals (OR = 0.68, 95% CI: 0.52–0.90), having a lack of motivation (OR = 0.81, 95% CI: 0.69–0.95) or a lack of childcare (OR = 0.69, 95% CI: 0.50–0.95) decreased the likelihood of dropout.

Conclusion ERS dropout continues to be problematic. Smoking and having moderate-high comorbidities predicted dropout. Increasing age and patient-reported barriers of a lack of time or childcare decreased dropout risk. The reasons for dropout require further investigation.

Keywords health promotion, physical activity, public health

Introduction

Exercise Referral Schemes (ERS) are used as a method of promoting physical activity (PA) in individuals who are at risk of, or who have developed, health conditions associated with a sedentary lifestyle.[1] ERS have been prominent since 1990s, with up to 89% of primary care organizations running a scheme,[2] typically running over 10–12 weeks.[3] Participants are referred following the identification of a need to increase PA by their General Practitioner or another healthcare professional.

Research has so far failed to establish the clinical and cost effectiveness of ERS to the point where the National Institute for Health and Care Excellence (NICE)[4] stated that ERS did not have sufficient evidence to support their use, unless part of a controlled trial. A commonly reported issue is a lack of participant adherence, with recent studies reporting adherence rates ranging from 43% to 53%.[5–8] NICE[1] recommended future research should focus upon factors encouraging uptake and adherence, and identify any barriers

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preventing participation, due to the limited research regarding the predictors of adherence/dropout or analysis of barriers to adherence. This study aimed to analyse data from a local ERS, with particular focus upon participant dropout, the effect of various referral characteristics on dropout and the predictors of dropout, including self-reported barriers to exercise.

Methods

Population and measures

Data were provided for the South Tyneside Council ERS between April 2009 and April 2014 for retrospective analysis.

The ERS was delivered within partnership of the local council, National Health Service (NHS) trust and Primary Care Trust, with all those referred being residents of and registered with a general practitioner within the local council area. ERS inclusion/exclusion criteria are found in Table 1. The ERS lasted 12 weeks, with a consultation before the programme started, and follow-up consultations at 6 and 12 weeks. The initial consultation involved input from an exercise professional and nutritionist.

All exercise professionals employed by the ERS were members of the Register of Exercise Professionals, held at least a Level 3 advanced gym instructor qualification/exercise referral qualification and accreditation in training/fitness testing. Sessions for high-risk participants were delivered exclusively by professionals with the British Association of Cardiac Rehabilitation qualification.

The consultation aimed to identify participants' readiness to change, individual goals and assesses the participants'

Table 1 ERS inclusion and exclusion criteria

Inclusion	*Exclusion*
Adults 16+	People with BMI ≤28 with no comorbidities
BMI ≥28 with or without a stable co-morbidity. Those with a BMI ≥28 with one or more of the following comorbidities	People who have previously been referred to the scheme
Osteoporosis	People who are already exercising on a regular basis
Arthritis or joint problems	Less than 16 years old
Anxiety, depression or stress	People who are not motivated and demonstrate no desire to make lifestyle changes
Asthma, bronchitis/emphysema/COPD. Angina/post-MI/CABG/PCI/completed phase III	People whose mental health or ability to learn would not allow them to participate in the programme
Mild to moderate heart failure	
Suffered from or are recovering from a stroke	
Claudication	Those showing symptoms or traits considered
Balance problems as a result of Parkinson's disease, MS, etc.	absolute contraindications to exercise:
	– Unstable angina
Awaiting or recovering from surgery (not cardiac)	– Unstable to acute heart failure
	– Specific cardiac problems
Non-acute severe mental illness	Active myocarditis:
Family history of heart diseases	– Exercise induced ventricular arrhythmias
Cholesterol levels consistently over 5 total cholesterol	– Hypertrophic obstructive cardiomyopathy
	– Significant aortic stenosis
Hypertension (<100 diastolic)	– Resting blood pressures above the recommended levels (cardiac patients 180/100, general population and patients diagnosed with hypertension 180/110)
All types of stable diabetes	
Hyperlipidaemia	
Inflammatory bowel disease	
Food intolerance or allergies	– Uncontrolled tachycardia, a resting heart rate
Renal/liver problems	≥100 bpm (≥120 bpm for COPD)
Other dietary problems, i.e. coeliac disease	Unstable diabetes
Hyperglycaemia-HbAIC level ≤10 at least 15 months	Any unstable condition
	Severe COPD with FEVI <40% with functional limitations disproportionate to the severity of the disease

COPD, chronic obstructive pulmonary disease.

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health status. Within the consultation, participants' body mass index (BMI), heart rate and blood pressure were measured. In addition, participants self-reported their smoking status (cigarettes/day), alcohol intake (units/week), PA levels (number of times physically active for ≥30 min/week), barriers that could prevent increasing PA levels (participants selected from a list of nine possible barriers including: Lack of time, Cost, Lack of motivation, Lack of confidence, Lack of support, Childcare, Transport, Illness/disability, Don't enjoy) and disability status. This information was rerecorded at 6- and 12-week consultations.

Following the initial consultation, participants obtained a tailored exercise plan facilitating PA increase. Plans varied in terms of exercises and session number, depending on participants' individual needs. Sessions were typically gym-based; however, the ERS could offer pool-based sessions for participants that could benefit from non-impact exercise.

The ERS categorized participants by 'Tier', with Tiers 2 and 3 eligible for referral. Tier 2 had low-moderate comorbidities and a BMI >28 kg/m^2, whereas Tier 3 had moderate-high comorbidities without any BMI restriction. The scheme defines low, moderate and high comorbidities using the National Quality Framework (NQF) for Exercise Referral systems.[9]

Within the literature, the term adherence is often cited, yet definitions of this differ. This study defines adherence as 'continued participation in the scheme', matching the most recent ERS systematic review[3] and is assessed at 12 weeks. Participants present at 12 weeks were considered as adherent, whereas those not present at either 6 or 12 weeks were considered as dropouts. Ethical approval for the study was obtained from the Northumbria University ethics committee.

Data extraction/management

Permission to use the data was provided by the ERS manager, and following anonymisation was provided for analysis in electronic format.

All data were error checked, any measures missing information were coded as 'not stated', with clearly incorrect entries (e.g. age 121 years) discarded from analysis. For potentially incorrect entries that were at the extremes of normal ranges (e.g. bodyweight of 187 kg), data were cross-referenced with other data entries for the same participant, and data not matching were discarded. Instances of data describing the same outcome but described differently (i.e. 'Improved' or 'got better') were standardized (i.e. changed to 'improved') to increase the consistency of terminology. Following this process, 6894 participants were available for analysis. Ninety eight participants did not start the scheme; however, this would not constitute 'uptake' as described in recent studies,[2,6] therefore statistical analysis was carried out excluding these participants.

Data recorded as 'not stated' were not included in the analysis for gender, referral tier, referral source or disability status. Not stated was infrequently recorded, would not provide valuable insight into the relationships between participants, therefore was excluded from analysis. In the case of referral type, 'not stated' was included in the analysis due to the high frequency of it being recorded (n = 3251), with maternity excluded due to low number of referrals (n = 1).

The final aspect of data management involved the grouping of data from each variable into categorical levels appropriate for statistical analysis. This process was carried out for referral reason, alcohol consumption, smoking and BMI. Evidence to support categorization is limited and heterogeneous. Where possible, all categorical grouping was applied using scales that have been previously used in publications or utilized by health organizations. Referral reasons were divided into 'musculoskeletal', 'mental health', 'cardiovascular/pulmonary/metabolic' and 'other'. The decision to keep mental health and cardiovascular diseases separate was based upon recent research,[5,6,8] which separated mental health and cardiovascular disease, whilst the use of musculoskeletal and 'other' categories captured the make-up of referral reasons within the data that were not otherwise categorized. Alcohol consumption,[10] smoking levels[11] and BMI[12] were all categorized using previously published guidelines or papers.

Within the 6796 participants that started the scheme, 3500 included data regarding barriers to exercise. In order to carryout logistic regression, all non-continuous data utilized as predictor variables (gender, age, referral type, referral source, tier, alcohol status, smoking status, PA level and nine separate barriers) were reduced into binary predictor variables with 'not stated' entries removed, leaving 3267 participants.

Statistical analysis

Statistical analysis was carried out using IBM SPSS version 22 for windows (SPSS, Inc., Chicago, IL, USA). Differences in referral or personal characteristics were investigated with Chi-square (χ^2) analysis and independent sample t-tests ($P < 0.05$ with 95% CI) between participants that adhered to and dropped out of the ERS. Separate binary logistic regressions were used to investigate whether any personal/referral characteristics and patient self-reported barriers to exercise could predict dropout at 6 and 12 weeks using data collected at initial assessment. Cox & Snell R^2, Nagelkerke R^2 and Hosmer & Lemeshow were utilized to investigate the model's goodness of fit.

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Results

Descriptive statistics

Between April 2009 and April 2014, a total of 6894 participants were suitable for analysis. Of note, 1.4% ($n = 98$) did not start the programme. At 6-week assessment, 37.8% ($n = 2608$) had dropped out, and by the final assessment at 12 weeks, 50.03% ($n = 3449$) had dropped out, leaving 49.97% ($n = 3445$) of the cohort adhering. Table 2 provides a full breakdown for each personal and referral characteristic.

Analysis of dropouts

Nearly 47% of males and 52% of females dropped out, representing a significant difference between gender groups ($\chi^2(1) = 20.113$, $P < 0.001$). Age was significantly different between groups ($t(6830) = -14.435$, $P < 0.001$), the mean age of those adhering being 51.1 ± 15.3 and dropping out 45.7 ± 15.6 years, respectively.

Primary care referrals had 51.1% dropout compared with 35.1% of secondary care referrals, which was significant ($\chi^2(1) = 52.190$, $P < 0.001$). Referral type differed significantly ($\chi^2(3) = 95.802$, $P < 0.001$) as referrals for nutrition had the highest rate of dropout (89.9%), compared with 46.6% of exercise referrals. Of note, 57.7% of referrals for a mental health condition dropped out, which was significantly different ($\chi^2(3) = 30.090$, $P < 0.001$) compared with musculoskeletal (50.9%), cardiovascular (48.1%) and 'other' (50.9%) referrals.

Referral tier was significantly different ($\chi^2(1) = 15.901$, $P < 0.001$) between Tier 2 (51.5% dropout) and Tier 3 (46.5% dropout). Those consuming moderate alcohol levels had significantly ($\chi^2(5) = 33.912$, $P < 0.001$) lower dropout rates (44.5%), compared with non-drinkers (52.5%), not stated (51.7%), hazardous (45.2%), harmful (61.2%) and drinkers that did not specify amount (60.6%). Differences in disability status were non-significant ($\chi^2(1) = 0.592$, $P = 0.442$) between adherers and dropouts.

Predictors of 6- and 12-week dropout

Six-week dropout

The full regression model containing all predictors was statistically significant ($P < 0.001$), indicating the model was able to distinguish between participants who did and did not drop out of the ERS by 6 weeks. The model as a whole explained between 4.2% (Cox & Snell R^2) and 5.7% (Nagelkerke R^2) of the variance in attendance, and correctly classified 64.5% of cases. Five independent variables made a unique statistically significant contribution to the model [Age, Alcohol (Drinker), Smoking (Yes), Tier (3) and Barrier A (lack of time)]. The strongest predictors of dropping out at 6 weeks were smoking (OR = 1.7, 95% CI: 1.39–2.07) or being a Tier 3 referral (OR = 1.24, 95% CI: 1.05–1.47), whereas increasing age (OR = 0.98, 95% CI: 0.98–0.99), drinking alcohol (OR = 0.74, 95% CI: 0.63–0.85) or having a lack of time (OR = 0.82, 95% CI: 0.67–0.99) decreased the likelihood of dropout (Table 3).

Twelve-week dropout

The full regression model containing all predictors was statistically significant ($P < 0.001$), indicating the model was able to distinguish between participants who did and did not drop out of the ERS by 12 weeks. The model as a whole explained between 5.2% (Cox & Snell R^2) and 6.9% (Nagelkerke R^2) of the variance in attendance, and correctly classified 60% of cases. Seven independent variables made a unique statistically significant contribution to the model [Age, Alcohol (Drinker), Smoking (Yes), Tier (3), Referral source (secondary care), Barrier C (lack of motivation) and Barrier F (lack of childcare)]. The strongest predictors of dropping out were smoking (OR = 1.58, 95% CI: 1.29–1.93) or being a Tier 3 referral (OR = 1.47, 95% CI: 1.25–1.73). Increasing age (OR = 0.98, 95% CI: 0.98–0.99), drinking alcohol (OR = 0.82, 95% CI: 0.71–0.95), being a secondary care referral (OR = 0.68, 95% CI: 0.52–0.90), having a lack of motivation (OR = 0.81, 95% CI: 0.69–0.95) or a lack of childcare (OR = 0.69, 95% CI: 0.50–0.95) decreased the likelihood of dropout (Table 4).

Discussion

Main findings of this study

Dropout within this ERS was 50%, most of which occurred in the first 6 weeks. Smoking or having moderate-high comorbidities (Tier 3 referrals) were the only predictors of dropout, whereas increasing age, being an alcohol consumer, a secondary care referral and citing barriers to exercise including a lack of motivation or childcare were predictors of not dropping out before programme completion.

Due to the paucity of research using predictor variables other than gender and age, it is difficult to make comparisons regarding individuals with moderate-high comorbidities (i.e. Tier 3 referrals) and those who consume alcohol, in terms of the effects that they have on ERS adherence. Previous studies regarding barriers to PA have either not focused specifically on ERS[13] or have only recorded barriers for participants that have dropped out,[14] making comparisons to this study difficult. Further investigation into why a lack of motivation or childcare predict adherence is required, as the findings appear counterintuitive.

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Table 2 Descriptive statistics of referrals

	Referrals (n)	*DNA Ax (n)*	*%*	*6/52 Dropout (n)*	*%*	*12/52 Dropout (n)*	*%*	*Started (n)*	*Completed (n)*	*Completed (%)*
Gender										
Female	4043	65	1.6	1598	39.5	2111	52.2	3978	1932	48.6
Male	2807	29	1.0	986	35.1	1311	46.7	2778	1496	53.9
Not stated	44	4	9.1	24	54.5	27	61.4	40	17	42.5
Age										
16–24	535	3	0.6	264	49.3	350	65.0	532	185	34.8
25–34	940	8	0.9	436	46.4	574	61.0	932	366	39.3
35–44	1249	16	1.3	493	39.5	668	53.0	1233	581	47.1
45–54	1585	21	1.3	604	38.1	815	51.0	1564	770	49.2
55–64	1346	25	1.9	423	31.4	548	41.0	1321	798	60.4
65–74	900	21	2.3	286	31.8	352	39.0	879	548	62.3
75+	277	3	1.1	77	27.8	101	36.0	274	176	64.2
Not stated	62	1	1.6	25	40.3	41	66.0	61	21	34.4
Referral source										
Primary care	6276	86	1.4	2421	38.6	3209	51.1	6190	3067	49.5
Secondary care	555	1	0.2	149	26.8	195	35.1	554	360	65
Not stated	63	11	17.5	38	60.3	45	71.4	52	18	34.6
Type of referral										
Exercise	2349	14	0.6	830	35.0	1090	46.0	2335	1259	53.9
Both	1166	8	0.7	467	40.0	614	53.0	1158	552	47.7
Nutrition	127	74	58.3	110	87.0	114	90.0	53	13	24.5
Maternity	1	0	0.0	0	0.0	1	100.0	1	0	0
Not stated	3251	2	0.1	1201	37.0	1630	50.0	3249	1621	49.9
Reason										
C/P/R/V/M	4534	80	1.8	1639	36.1	2180	48.1	4454	2354	52.9
MSK	1116	7	0.6	424	38.0	568	50.9	1109	548	49.4
Other	212	7	3.3	82	38.7	108	50.9	205	104	50.7
Mental health	1032	4	0.4	463	44.9	593	57.5	1028	439	42.7
Year										
2009–10	306	0	0.0	135	44.1	169	55.2	306	137	44.8
2010–11	1570	0	0.0	551	35.1	790	50.3	1570	780	49.7
2011–12	1368	2	0.1	510	37.3	666	48.7	1366	702	51.4
2012–13	1546	31	2.0	547	35.4	703	45.5	1515	843	55.6
2013–14	1244	47	3.8	452	36.3	586	47.1	1197	658	55
2014–15	860	18	2.1	413	48.0	535	62.2	842	325	38.6
Referral Tier										
Tier 2	3827	62	1.6	1490	38.9	1971	51.5	3765	1856	49.3
Tier 3	2689	34	1.3	949	35.3	1250	46.5	2655	1439	54.2
Maternity	67	0	0.0	29	43.3	54	80.6	67	13	19.4
Not stated	311	2	0.6	140	45.0	174	55.9	309	137	44.3
Disability										
No	5602	5	0.1	2036	36.3	2746	49.0	5597	2856	51.0
Yes	630	1	0.2	237	37.6	319	50.6	629	311	49.4
Not stated	662	92	13.9	335	50.6	384	58.0	570	278	48.8
PA no. times active ≥30 min/week										
0	2955	0	0.0	1178	39.9	1568	53.0	2955	1387	46.9
1	691	0	0.0	239	34.6	321	46.0	691	370	53.5

Continued

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Table 2 Continued

	Referrals (n)	DNA Ax (n)	%	6/52 Dropout (n)	%	12/52 Dropout (n)	%	Started (n)	Completed (n)	Completed (%)
2	1038	0	0.0	331	31.9	453	44.0	1038	585	56.4
3	754	0	0.0	246	32.6	340	45.0	754	414	54.9
4	369	0	0.0	129	35.0	179	49.0	369	190	51.5
5	350	0	0.0	124	35.4	160	46.0	350	190	54.3
5	594	0	0.0	235	39.6	299	50.0	594	295	49.7
Not stated	143	98	68.5	126	88.1	129	90.0	45	14	31.1
Alcohol intake (units/day)										
Non-drinker	1479	0	0.0	621	42.0	776	52.5	1479	703	47.5
Yes	33	0	0.0	12	36.4	20	60.6	33	13	39.4
Moderate (≤21 M, ≤14 F)	1540	0	0.0	498	32.3	685	44.5	1540	855	55.5
Hazardous (>21–50	376	0	0.0	129	34.3	170	45.2	376	206	54.8
M, >14–35 F)										
Harmful (>50 M, >35 F)	49	0	0.0	21	42.9	30	61.2	49	19	38.8
Not stated	3417	98	2.9	1327	38.8	1768	51.7	3319	1649	49.7
Smoking status (cigarettes/day)										
No	5662	1	0.0	1932	34.1	2628	46.0	5661	3034	53.6
Yes	1061	1	0.1	538	50.7	673	63.0	1060	388	36.6
<9	1	0	0.0	1	100	1	100.0	1	0	0
10 > 19	9	0	0.0	7	77.8	9	100.0	9	0	0
>20	9	0	0.0	7	77.8	9	100.0	9	0	0
Not stated	152	96	63.2	123	80.9	129	85.0	56	23	41.1
BMI (kg/m^2)										
Underweight (<18.5)	22	0	0.0	11	50.0	13	59.1	22	9	40.9
Normal (18.5–24.99)	686	0	0.0	264	38.5	345	50.3	686	341	49.7
Overweight (25–29.9)	1867	0	0.0	628	33.6	840	45	1867	1027	55.0
Obese Class 1 (30–34.99)	2118	0	0.0	777	36.7	1023	48.3	2118	1095	51.7
Obese Class 2 (35–39.99)	1268	0	0.0	493	38.9	656	51.7	1268	612	48.3
Obese Class 3 (>40)	794	0	0.0	319	40.2	451	56.8	794	343	43.2
Not stated	139	98	70.5	116	83.5	121	87.1	41	18	43.9
Total	6894	98	1.4	2608	37.8	3449	50.03	6796	3445	49.97

DNA, did not attend; C/P/R/V/M, cardio pulmonary/respiratory/vascular or metabolic; PA, physical activity; M, male; F, female; MSK, Musculoskeletal; FEVI, Forced Expiratory volume I.

At present there is no available research regarding secondary care referrals as they have been excluded from most studies and recent systematic reviews.[3,15] Despite secondary care referrals being in the minority in this study (8% of entire cohort, 9.6% included in the regression), these referrals made a significant contribution to the model, indicating that secondary care referrals were less likely to drop out.

In this study, the largest proportion of dropout occurred in the first half of the ERS. Between initial and 6-week assessment, 37.8% dropped out, compared with an additional 12.1% dropout between weeks 6 and 12 in the second half of the ERS. Although run over 24 weeks as opposed to 12, Hansen et al. reported a similar finding whereby the highest dropout rate occurred in the first half of the ERS.[5]

What is already known on this topic

Dropout/adherence

This study supports the notion that ERS suffer from dropout, a consistent finding within the ERS literature. Previous work[5–8] has mirrored this study and reported that ERS adherence lies between 43% and 53.3%.

Positive and negative predictors of dropout

Smoking was predictive of dropout at Weeks 6 and 12, which supports previous ERS literature where smokers have suffered higher dropout.[16] Increasing age has commonly been reported as a predictor of adherence within the literature.[3,5,6,8,14] Despite increasing age being a predictor of

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Table 3 Logistic regression to predict dropout at 6 weeks

Predictor	B	P	*OR*	*95% CI*
Gender (female)	0.005	0.95	1.01	(0.862–1.173)
Age	−0.017	0.00	0.98	(0.978–0.988)
Referral type (exercise)	−0.141	0.09	0.87	(0.737–1.023)
Referral source (secondary)	−0.225	0.13	0.8	(0.597–1.066)
Tier (Tier 3)	0.213	0.01	1.24	(1.045–1.466)
Alcohol (drinker)	−0.308	0.00	0.74	(0.633–0.853)
Smoking (smoker)	0.528	0.00	1.7	(1.391–2.067)
PA	0.015	0.43	1.02	(0.978–1.054)
BMI	0.004	0.56	1	(0.992–1.016)
Lack of time	−0.202	0.04	0.82	(0.677–0.986)
Cost	−0.194	0.07	0.82	(0.67–1.013)
Lack of motivation	−0.064	0.44	0.94	(0.796–1.105)
Lack of confidence	0.090	0.38	1.09	(0.896–1.336)
Lack of support	0.393	0.10	1.48	(0.929–2.36)
Childcare	−0.152	0.37	0.86	(0.616–1.197)
Transport	0.136	0.58	1.15	(0.708–1.853)
Illness/disability	0.022	0.83	1.02	(0.837–1.249)
Do not enjoy	−0.100	0.69	0.91	(0.55–1.488)
Constant	0.235	0.43	1.27	—

Brackets indicate dichotomous variable chosen to code as the variable considered as being present. *B*, beta value; OR, odds ratio.

Table 4 Logistic regression to predict dropout at 12 weeks

Predictor	B	P	*OR*	*95% CI*
Gender (female)	0.073	0.33	1.08	(0.927–1.249)
Age	−0.02	0.00	0.98	(0.975–0.985)
Referral type (exercise)	−0.16	0.05	0.85	(0.727–1)
Referral source (secondary)	−0.39	0.01	0.68	(0.517–0.895)
Tier (Tier 3)	0.384	0.00	1.47	(1.245–1.731)
Alcohol (drinker)	−0.19	0.01	0.82	(0.712–0.953)
Smoking (smoker)	0.458	0.00	1.58	(1.294–1.932)
PA	0.031	0.09	1.03	(0.995–1.07)
BMI	0.01	0.09	1.01	(0.999–1.022)
Lack of time	−0.18	0.06	0.84	(0.702–1.005)
Cost	−0.05	0.62	0.95	(0.779–1.162)
Lack of motivation	−0.22	0.01	0.81	(0.687–0.945)
Lack of confidence	0.162	0.11	1.18	(0.967–1.432)
Lack of support	0.08	0.74	1.08	(0.678–1.731)
Childcare	−0.37	0.03	0.69	(0.499–0.953)
Transport	0.089	0.71	1.09	(0.681–1.755)
Illness/disability	0.019	0.85	1.02	(0.839–1.238)
Do not enjoy	−0.21	0.40	0.81	(0.201–1.314)
Constant	0.46	0.11	1.58	—

Brackets indicate dichotomous variable chosen to code as the variable considered as being present. *B*, beta value; OR, odds ratio.

scheme adherence, the whole cohort was only comprised of 36.6% of participants aged over 55 years old. In terms of the 3267 participants included in the regression, 37.7% were 55 years or older. Previous work has reported a similar finding,[5] the minority (48%) of a cohort being over 55 years, yet increasing age still predicted adherence. This finding lends support to a previous suggestion,[5] which considers that future ERS could focus on those 55 years and older, or that further investigation of, or targeting of ERS for the under 55s is required.

What this study adds

The use of participant self-reported barriers to PA with the aim of predicting dropout/adherence is novel and is a direct attempt to address the lack of knowledge regarding factors and barriers to ERS adherence as identified by NICE.[1] In addition, the use of predictor variables such as disability status, referral source, smoking and alcohol consumption within a single cohort provides new insight into factors/barriers affecting ERS adherence.

Limitations of this study

A common issue with routinely collected data is missing values or erroneous entries.[17] This study highlights the issue, as only 3267 of 6894 data sets were complete. For some analysis (e.g. gender), this was not an issue, however for referral type, over 3000 cases of 'not stated' were recorded. The effect of this is seen in Tier 2/3 analysis. Chi-squared analysis analysed a larger number of participants, suggesting that Tier 2 referrals were more likely to drop out. Conversely, logistic regression analysed less participants, but included more variables into the model, suggested that Tier 3 referrals increased dropout likelihood. In terms of analysis, this resulted in an inability to draw associations across the many variables involved in this ERS and made interpretation difficult.

Aside from the difficulties of recall in self-reported measures,[18] that may impact on the measurement of alcohol and smoking within this study, the measurement of the barriers to exercise also has limitations. At initial assessment, the barriers were recorded as barriers that could prevent increasing PA levels. It is not known what the actual barriers were during the scheme. The ramification of this is that a barrier stated at initial assessment may not actually manifest itself, making it not possible to ascertain if the barriers did indeed impact on adherence, particularly in participants that dropped out. In addition, it is conceivable (as evidenced in the findings that a lack of confidence or lack of childcare were predictors of adherence) that participants could

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overcome what they perceived to be barriers that could prevent PA level increases at initial assessment. Future research could measure during each assessment, the actual barriers to exercise to explore the relationships between the barriers, adherence and changes to barriers during the course of the programme, or within participants that drop out.

If all 6894 participants had full sets of data, the effect this would have had on the logistic regression analysis is unknown. The logistic regression was able to only predict up to 60% of dropouts, as the factors analysed only provided a minimal increase in predictive accuracy, suggesting that other factors may have an influence on the rates of dropout.

Conclusion

Participant dropout within the South Tyneside ERS was 50%, with those who smoke, are younger, or a Tier 3 referral, more likely to drop out. This highlights the complexity of ERS adherence, suggesting that different subgroups of participants require different approaches to increase PA levels, or may not be suitable for ERS in isolation. However, further investigation into why these participants are more likely to drop out is required. From this study, it appears citing a lack of motivation or childcare as barriers to exercise predicts ERS adherence; this is unique within the literature and requires further investigation.

Conflict of interest

Diane Walker is the manager of South Tyneside Exercise Referral Scheme. She was not involved in the analysis or interpretation of the data.

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